THE TIMES
LITERARY SUPPLEMENT

T·L·S

30 APRIL 1970
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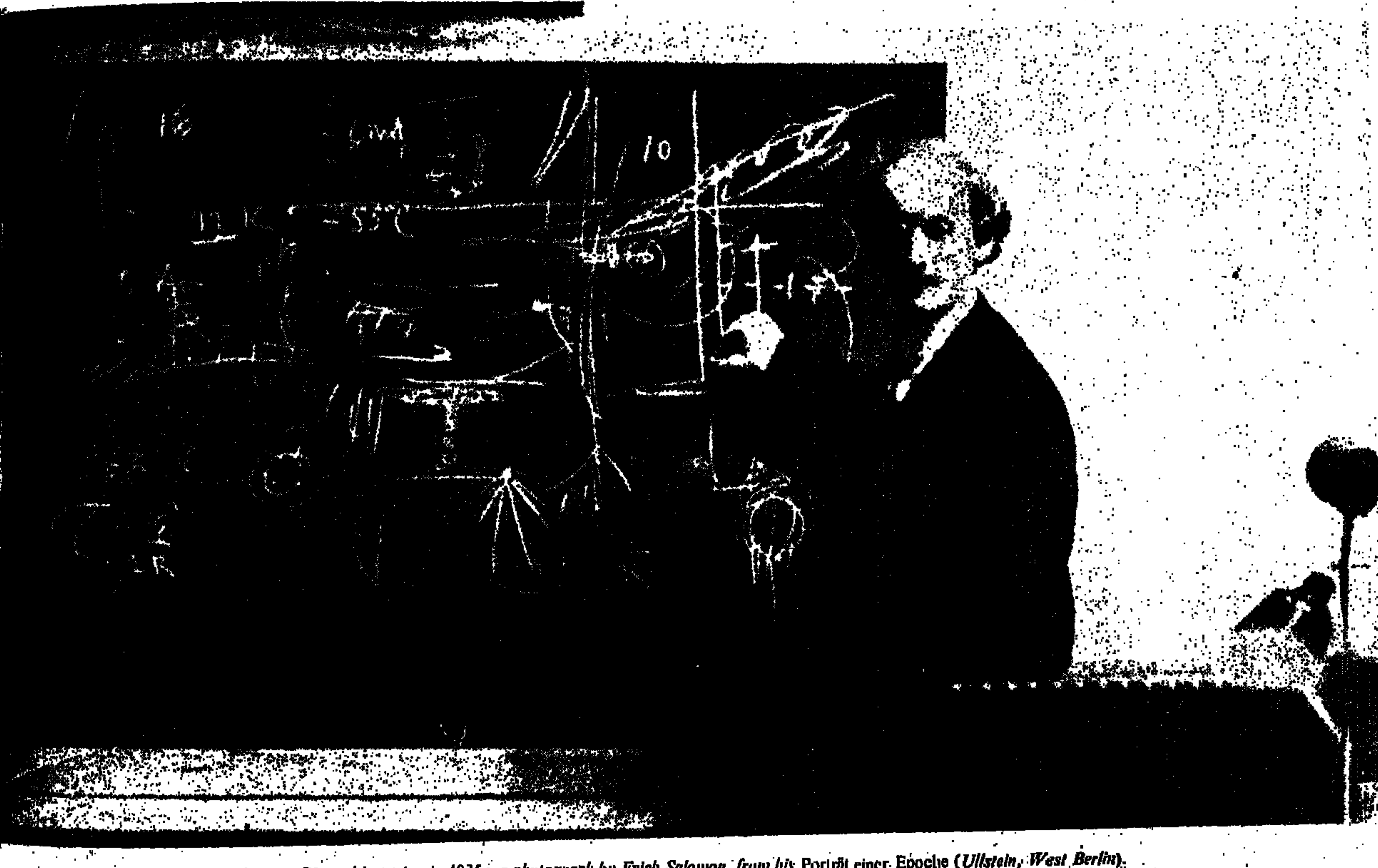

Auguste Piccard lecturing in 1935: a photograph by Erich Salomon, from his Porträt einer Epoche *(Ullstein, West Berlin).*

THE REVIEWING OF SCIENTIFIC BOOKS

BY SOLLY ZUCKERMAN

rcely anything is more im- rtant to the growth of scienti- knowledge than vigorous : and in the long run noth- be more significant to the knowledge about science general appreciation of the criticism which different- ood science from bad, and from real science. In decid- concern itself more closely these matters (see Leading page 508), the *TLS* is aking a task which is every bit ficant as the one which over ars has established it as the English review journal of ntific literature.

n immensely difficult task. literature begins with the scientific journals in "original" papers appear pert scientific referees, un- to the authors, have certified articles merit publication they are significant addi- scientific knowledge. It in- dozens of specialized devoted to reviews of research, and endless written collectively by ex- who focus on the several of particular subjects; as the books and monographs by men who are acknowl- authorities in their special of interest. But where scien- literature ends is another There are articles which pamphlets or in journals basically for commercial some may also regard as literature the books which in terms of presumed concepts to capture a wide either through a sexual or some other sensational appeal. Presumably scientific literature does not extend as far as the self-declared "science fiction" which, by beguiling an ever-increasing reading public with fantasies about supposed scientific possibilities, at the same time frequently misleads them about the nature and purposes of science.

The diverse nature of scientific literature is exceeded only by the growing diversity of the subject matter of scientific inquiry. The range of science has never known any bounds, and its horizon is now widening at an ever-increasing pace. A professional critic of novels or biographies presumably experiences little difficulty in turning from one to another book in some wide field of literature in which he has a general interest. But few scientists can move with assurance outside their own fields of narrow expertise, and those who read more widely would very likely find more to capture their attention in the pages of the *TLS* than they would in those of the periodical *Nature*, the bulk of whose contributors are working scientists. Their reading in *Nature* might well be confined to articles dealing with what is loosely called "science policy", and to pieces relating to a small number of strictly scientific subjects about which they keep themselves professionally informed. Indeed, the spectrum of modern science has become so wide that the vast majority of working scientists are blind to the interests of scientists working in other fields, and prisoners of their own specialities.

The task of keeping "scientific literature" under a general and systematic review is thus well-nigh impossible; and it is almost impossible too to conceive of those high standards of criticism which one associates with reviews of non-scientific literature—written by scholars who themselves are not necessarily professional authors of books—being achieved by writers who are not actively following the progress of a field of research. Any new scientific paper or book which embodies new observations and concepts is itself a review. It either invalidates the views expressed in some paper or book that has gone before, or significantly reinforces the generalities and hypotheses on which they are based. Ideally, therefore, professional critics of scientific literature need to be scientists who work in the particular field about which they write.

Unfortunately, the standards of scientific criticism in practice often

ALSO IN THIS ISSUE

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fail to live up to this ideal—which is not surprising in view of the vast and world-wide expansion of scientific activity over the past two decades. Articles in professional review journals, or notes in journals of abstracts designed to keep specialists in touch with the literature of their particular fields of interest, can become mere catalogues, sometimes prepared by secretaries who are not research scientists, in which no attempt is made to differentiate good papers from bad, or in which the emphasis is often laid on papers which—regardless of their own scientific or technical merit—support the particular views of the reviewer.

The multiplication of scientific papers and scientific books over the past few years has also become associated with the development of enclaves of science where vested interest makes their practitioners immune from almost all criticism, and where, because of the authority of some of the individuals concerned, ample research funds are easily obtained to keep building on thoroughly insecure foundations. In a recent presidential address to the Royal Statistical Society, Dr. Frank Yates, F.R.S., observed that his own subject, to whose basic ideas he has contributed so richly, is in danger of being obfuscated by a tangle of what can only be described as unnecessary weeds. He tells us that it often happens that one statistician publishes a theoretical paper which is either irrelevant to statistical theory in general or is based on unrealistic premises. This stimulates a second and then a third writer to publish further thoughts on the same lines. And as a result, as he says, "our statistical journals become cluttered up by vast amounts of rubbish", on the basis of which a new lot of students then build. This sort of thing is, of course, not unique to science: but it is particularly dangerous in a period of history in which the currency of science is held in such high esteem.

The scientific journalist can hardly help reflecting, and thus reinforcing, scientific fashions, good or bad. The wilder the speculations about the possible implications of the work of a brand of scientists who are not averse to sensationalism, the greater the appeal of its journalistic elaboration for a public whose reading of science is limited to pieces in newspapers. No one, for example, knows whether there could ever be "test-tube babies", or whether so-called genetic surgery could result in the formation of "man-animal hybrids". Few believe that people will ever be able to choose the sex of their unconceived offspring. No one knows whether cancer will ever be eradicated, nor, to refer to an even more extreme piece of verbalism, whether the computer could ever "take over" from the human brain. But this does not stop the so-called "science correspondent" from claiming that such things are "not altogether fantastic prospects". The immediate result is that the uninformed reader then treats these suppositions as scientific fact, in the same way as he may be encouraged to believe that he has been enlightened about his sexual, or acquisitive, or aggressive instincts by being told that there are corresponding forms of behaviour in the animal world.

Another difficulty has now been added to the many problems which beset both scientific reviewing and the reputable popularization of scientific literature. Public criticism has always been part of the scientific process; and working scientists have always implicitly accepted this form of open exposure. It adds to their professional standing when their views and findings are confirmed, at the same time as it can threaten their downfall when the reverse happens. It has always been the rule that those who labour to provide new scientific knowledge, and the new concepts to which such knowledge leads, should be ready to risk the intellectual stakes involved.

But a new mode of scientific debate also seems to be emerging. A libel action is being brought by Mr. Stanley Lithgow Drummond-Jackson, a dental surgeon, who is suing both the authors of a paper which evaluated some of his work, and the British Medical Association in whose journal the paper was published, because, he claims, it was defamatory of him in the conduct of his profession. In a preliminary application, the court of appeal, by a majority of two votes to one, has held that the words complained of were capable of a meaning defamatory of him. Consequently, as an editorial in *Nature* points out, a libel action is now (for the first time) to be a forum for the settlement of a scientific dispute. The litigation in this matter has not ended, but, as *Nature* points out, its outcome could well determine whether similar actions could not be brought in respect of papers that have already been published—and so threaten the whole basis of the free criticism which has always characterized the scientific process.

One can only hope that none of this will happen. In spite of the vast spread of education over the past few years, we have not yet achieved that general standard of critical scientific literacy which would help make it plain to a reader who is not a professional scientist when scientific views have been constrained either by fashion or by the force of authority. Indeed one can well ask whether the wider reading public of today is relatively as well informed and as scientifically literate as was the smaller one of a hundred years ago.

Would today's reading public demand edition after edition of Darwin's *Origin of Species*, or would it be satisfied merely by some comment on the book in the daily and weekly papers? Would it be bothered to read, as were the Victorians, Herbert Spencer's *Principles of Sociology* chapter by chapter as they came hot from the press, with on occasion an apology for a delay in their appearance because a cold had prevented the author from keeping up to schedule, or would it wait for a short digest of the finished book in some paper or other? One fears that it would choose the easier path. And this is why one cannot but laud the new endeavour of the *TLS* to help to broaden the base of the one culture to which we all now belong. The reading public deserves to be helped in learning what constitutes science, to appreciate the nature of scientific controversy, and to understand what are established scientific facts and concepts, as opposed to speculations and what is just rubbish. The practical applications of science may ofte tional, but scientific itself is not that. Scientists a duty to help the public ate real science from some titillating nonsense and which get served up in a The latter may be the mo tive, but synoptic reviews tific authorities of advan special fields of interest, their significance to other our culture, are much to ferred.

Science has now been add fiction and biography, and politics with which concerns itself in a contin By including science in its interest the journal, needle is unlikely to become a periodical in the ordinary this new step does mean publication which over has done so much to reading public in the field eral literature has unde help lead them into new paths, paths which it followed only on rare And in undertaking this ture, the *TLS*, with the high it has always set, should help guide many scientis their accustomed and narrow nels into wider and, eve waters.

Confrontations through bars

HEINI HEDIGER :
Man and Animal in the Zoo
Translated by Gwynne Vevers and Winwood Reade.
303pp. Routledge and Kegan Paul. £4 4s.

The past few years have seen man emerge as an object of intense popular scientific interest. It is possible that the recent books by Desmond Morris or Robert Ardrey would not have achieved quite such wide currency had there not been prevalent already a brisk climate of public curiosity about our origins and essential qualities. A number of streams of inquiry, long pursuing their separate ways, seem finally to have met. The resultant spate has captured some unexpected tributaries, while its surface bobs with many a discarded theory and long-cherished prejudice. Future generations will doubtless see the relevance between this drive to span or combine various biological disciplines and the explosive society in which it is taking place.

Certainly, at no time since Darwin has scientific research on man's relationship to and with animals been of such absorbing interest. Comparisons between man's behaviour or physiology and those of other primates provide the most fascinating topic, for years turned on its head and appearing as anthropomorphic animal stories, but now increasingly anthropocentric. Rapidly gaining ground, however, are such subjects as conservation, animal lore and zoos, all of them closely wrapped in a human context. The zoo story is particularly interesting because it embodies not only the seeds of so many zoological themes but also the real root of this recent preoccupation: the confrontation of man and animal. Physically, the zoo is often the *only* tangible confrontation now possible for urbanized society.

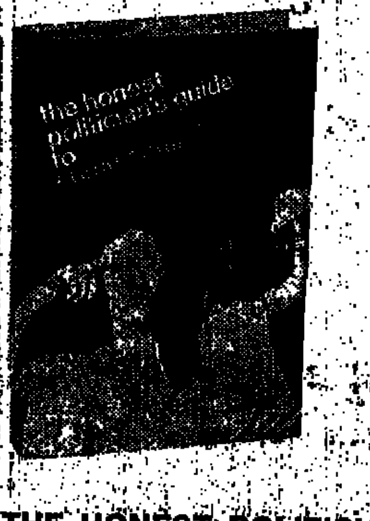
Essentially, it is this confrontation that Professor Hediger describes in his book. On neither side does he penetrate too deeply, not because he cannot—his many published works testify to considerable study in depth—but because the theme of the confrontation can happily jog along for 300 pages without flagging. The pace is distinctly measured and thorough. What does man mean to the animal? What does the animal signify to man?

What is a zoo all about and what is its place in urban society? Professor Hediger rarely falters and the combination of a scientific outlook with twenty years' experience as a zoo director (first at Basle and then at Zürich) produces many thoughtful, imaginative conclusions.

The subtitle, "Zoo Biology", is the key to Professor Hediger's approach to the zoo. He sees zoo biology as literally everything in the zoo that is biologically relevant. This leads to a synthesis that reaches far beyond the limits of traditional zoology. In exploring the confrontation it is necessary to explore also the domains of human and animal psychology, veterinary medicine, psychiatry, sociology, architecture, landscape gardening, and even criminology, for he hints at the psychologically beneficial effects that a zoo may have on juvenile delinquents. He decries the humanization of animals, both within the zoo and outside. He decries the general lack of university support for zoos, which would otherwise enlarge the research spectrum of both institutions. In fact, Professor Hediger decries a great deal of current zoo practice, but he sets out very clearly his own well-reasoned alternatives based rent human and animal tions. This is certainly should be studied by zoo and their staff and associated with the

What about the almost every chapter ment on how the public within a zoo, sometimes credit but sometimes not. The malpractices, for example, many of the apparently attempts that one makes the animals to stop just and "do something". The of foreign bodies that have or killed valuable specimens as much on the careless as on the thoughtless visitor, the scolding, however, we given many useful indica how much more we could from the zoo if we knew look for.

The text is embellished plates, ranging from the (graffiti scrawled on the rhinoceros) to the horrific severed hand in the elep The translation is excellent book is most readable, its tion and content deserving audience.



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Norval Morris and Gordon Hawkins

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W F Deedes MP *Sunday Telegraph*

'Although the problem of law and order is still small here in comparison with America, the politicians are preparing to make just as large a noise about it. They might make a very much more sensible noise, if they took the trouble to read this book first of all.' Giles Playfair

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Edited and Translated by Mirra Ginsburg

Yevgeny Zamyatin was one of the few writers in post-Revolutionary Russia to stand up openly to the regime and its suppression of freedom. Although his books are banned in Russia to this day, Zam nevertheless exerted a profound influence on emerging Soviet lite as craftsman, teacher and critic. volume is the most comprehensive collection of his essays to appear any language.
86s.

The University of Chicago Press
126 Buckingham Palace Rd
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ife and death questions

LD LEACH :
ocrats
Cape. 35s.

HARRIS :
sion
ham Lectures.
Clarendon Press: Oxford
sity Press. £2. (Paperback, 20s.)

ER FUHRMANN and
ICH VOGEL :
Counselling
e for the Practicing Physician.
ed by Sabine Kurth.
Longmans. 25s.

Leach is the science correst of *The Observer*, and he has the word "biocrat" to des "technocrats of biology and who have taken charge of biomedical trend that society er agreed to but which is now d to alter". Journalists, and some of the biocrats themhave been responsible for a misunderstanding, not to say e, about what is being done s in the biological sciences, of which—dealing as it does life and death and sex and retion—certainly lends itself to nal treatment. But Mr. has successfully resisted these tions, and has in *The Biocrats* ced quite a sober and well-nced review of some exceedingly ult and controversial problems which the non-biocrats are to have to make up their minds or later, whether we like it or

treatment of different topics variable, but the section on e breeding and eugenics is enough; while "heroic" surwith organ transplants and so d life-sustaining machines, are with very fairly. He also dis over-population and birth l, as well as abortion and asia for young and old, from entionally progressive point of Mr. Leach writes in an easy stic style, but he manages to seriously misleading over-simtion, and anyone who reads his will be the better informed some most important issues no responsible person should feel can safely be left to the

difficulties really all derive the fact that *Homo sapiens* is a animal species, which means dividual survival and reprois controlled only by natural and not by deliberate from outside as happens with ated animals. Almost everyould agree that it was quite to decide (who is to decide?) off undesirable but otherwise individuals, and nearly as forcibly to stop them from An animal breeder thinks and wrong to do anything else is stock, but wild animals are take their chance, and that is sis of human ethics for our species.

civilized people are also by feelings of compassion tothe needy and the sick, which us to do what we can to help who cannot help themselves; not prepared simply to let take its course in eliminating That does not mean that natural selection has been stopped, as is often supposed. Selection occurs whenever any individual who could have been conceived is prevented, otherwise than in a purely random way, from realizing his or her full reproductive potential. That will always be so, and evolution by selection continues, though it may be diverted into other and possibly less desirable channels. Until quite recently this probably has not mattered too much, because there was really very little that could be done to save the seriously diseased and defective.

This is now being changed, and changed very rapidly indeed, as a result of advances in biological knowledge and medical technology, most of which have been made within the memory of people still alive. There is the prospect of immeasurably greater advances during the lifetime of children already born. Already we can and do preserve the lives of people we all know would be much better dead, and who certainly would be dead without our own deliberate interference with the natural course of events. We do this because we feel we can do no other, at enormous and rapidly increasing cost in money, time, and trouble, and in the sure knowledge that we are increasing the total of human misery, as the price of salvaging a few useful and happy lives.

"Thou shalt not kill; but need'st not strive/officiously to keep alive" is all very well as a guide for a doctor deciding to switch off the machine keeping somebody alive who clearly has no hope of recovery; but there are many much more difficult decisions than that. What about a hopelessly deformed infant bound to die in a matter of months, whose life could be saved by surgery to allow it to survive helpless and incontinent, but fully aware of its condition, into old age? If the decision is that it is kinder to do nothing, is it really morally better to let it die slowly, rather than to kill it off humanely straight away? Or an old man afflicted with some incurable disease, who could be given years more of quite useless life on a machine at enormous expense, not only of money but of scarce resources which could better be used for others who could be cured. It is easy enough to say that he should be allowed to die quietly and with dignity, with no officious interference from anyone else. But he may linger on quite a time, and is a slow and painful death really so much more dignified than a quick kill? Voluntary euthanasia can never be the answer for more than a very small minority, since most of the worst cases are in no condition to consent to anything at all, and even enthusiasts for euthanasia usually boggle at the prospect of disposing of anyone who has not freely consented to die.

These are some of the terrible problems facing us now, as side-effects of otherwise beneficial advances, and they are not going to disappear by being ignored, nor is it any good blaming the biocrats for not having technical answers to what are not technical questions at all.

As Professor of Pathology at Oxford, Henry Harris is a bit of a biocrat himself, and he has devised an elegant method for getting animal cells to fuse together after treatment with inactivated virus, which leaves them fully viable and able to grow and divide through many cell generations. Cells from quite unrelated species, rabbits and chickens and men, can be fused together to give a single nucleus, without any of the rejection effects usually shown by grafts of tissues. This provides a valuable tool for the genetical analysis of cell differentiation and related studies, and in the three lectures printed in *Cell Fusion* Professor Harris gives an interesting and fully documented, though highly technical, survey of what has so far been achieved, with prospects for future research. Farther away there are some more disturbing possibilities. Although it is scarcely conceivable that man-animal chimeras should ever be produced as viable individuals, instead of just as single cells, this is a technique that probably could be developed to generate families of identical twins, by transplanting nuclei from ordinary body cells into enucleated eggs, which could then be persuaded to continue their normal development.

It would be worth trying this with domestic animals: for example, a herd of cows, all identical twins of a champion milker, might be an economic proposition. And if it could be done with cows it could be done with men, to give large families of identical twins of Nobel Prize winners, perhaps. Not a particularly pleasing prospect, but are we to refuse to allow such work with cows, for fear that it might later be misused with men?

Human genetics is another field which has seen tremendous developments over the past few decades, and the inheritance of several hundred rare but often highly damaging defects is now fully understood. People from affected families, who may themselves be perfectly normal, can therefore be advised of the risk they run of passing a defective inheritance on to their children or remoter descendants, and sometimes they ought to be persuaded that it would be most irresponsible to produce any children at all. Such cases are rare, and a general practitioner would expect to see only a few during the course of his whole career. But he needs to be on the lookout and, although diagnosis and the assessment of risk is a matter for experts, the family doctor may often be better fitted to pass on and explain the expert advice to his patient.

Genetic Counselling is a slim paperback translated rather unevenly from the German and described as "a guide for the practicing (sic) physician to genetic counseling". It is not a book for anyone with no previous knowledge of genetics, and it goes some way beyond the minimum needed for passing on advice to patients and answering their questions. Students and doctors wanting to keep up a general interest in medical genetics could read it with profit, but it is not a specialist text nor is it by any means complete, and it would be a pity if any practising physician reading it were to feel that he was now equipped for genetic counselling, with no need to refer what might look like straightforward cases for specialist advice.

OUR CONTRIBUTORS

Sir Solly Zuckerman is chief scientific adviser to the Government and chairman of the Central Advisory Council for Science and Technology.

H. C. Longuet-Higgins (p. 505) is Royal Society Research Professor in the Department of Machine Intelligence and Perception, University of Edinburgh.

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Margaret Gowing (p. 515) is reader in Contemporary History, University of Kent, and historian to The Atomic Energy Authority.

D. J. Urquhart (p. 519) is Director of the National Lending Library for Science and Technology.

Doi Toshitsura's snow-flake crystal drawings (1832) are taken from the book reviewed on page 509.

PUBLISHED MAY 14th

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MULLER

U.N. in arms

ROSALYN HIGGINS:
United Nations Peacekeeping 1946-1967
Volume 2: Asia.
486pp. Oxford University Press for the Royal Institute of International Affairs. £4 10s.

Military forces, acting as observers or combatants, have operated under the U.N. flag in three main areas, the Middle East, Asia, and Africa. In every case these direct U.N. interventions have, in some form or another, been due to the aftermath of colonialism and the instability which necessarily follows from major changes in power relationships. The U.N. flag may sometimes have dampened down conflict, but it has certainly not escaped from controversy and has often indeed been at the centre of it. In her three volumes, Rosalyn Higgins is seeking to present, in a systematic fashion and with useful linking commentaries, the most important documents relating to these various actions.

The first volume (reviewed in the *TLS* on August 7, 1969) dealt with actions in the Middle East; the third will mop up the Balkans, Cyprus and the Congo. The present volume deals with all the operations in Asia. It covers the U.N. observers in Indonesia (1947-50), the observers and security force in West Irian (1962-63), the Korean War (1950-53), and the observer groups in India and Pakistan since 1949. The inclusion of the Korean War in a survey of "peace-keeping" operations is surprising, and it sounds suspiciously like double-think. But for the purposes of her trilogy Rosalyn Higgins has defined such operations as those

> in which personnel owing allegiance to the U.N. are engaged in military or para-military duties; and/or are carrying weapons for their own defence in the pursuit of duties designated by the U.N. as necessary for the maintenance or restoration of peace.

This definition, as the author would hardly deny, is as arbitrary as most attempts at finding a single definition of a word which describes a complex set of phenomena. But, if one complains about its arbitrariness, one can at the same time be grateful for the comprehensive range of U.N. documents on Korea which Rosalyn Higgins offers us.

The documents and commentaries on Korea deal not only with the war itself, but also with the setting-up of the United Nations Temporary Commission on Korea in 1947. They thus highlight a degree of continuity in the United Nations (as well as United States) involvement in the Korean situation before the outbreak of major hostilities in June, 1950. Some of the broader questions raised by the Korean War, however, necessarily receive slight attention or none at all in these pages. It is in the nature of official documents that one cannot immediately grasp from them alone the political realities underlying certain actions; and the extent to which the United Nations involvement in Korea was window-dressing for a previous United States commitment is one of those much discussed international questions about which this book says disappointingly little. Likewise, the long-term effect of the Korean War on the United Nations' standing in Asia is largely ignored. The precedent of the Korean action has, in fact, more or less ruled out the possibility of direct United Nations intervention in any conflict involving the Asian communist states, whether it be an open war as in Vietnam, or a more limited dispute as between China and the non-communist remnants around its seaboard.

But the reader who approaches these volumes hoping for an analysis and assessment of the effects of these interventions on the international system is approaching the books in the wrong spirit. Essentially Rosalyn Higgins is presenting source materials in an intelligible and manageable form, with admirably clear commentaries designed to elucidate purely what happened, rather than to describe all the political background, international ramifications and future implications. The clear structure of these volumes, the full indexing and the admirable printing and production greatly enhance their value for both the student and the practitioner of international relations.

People at odds

EVAN LUARD (Editor):
The International Regulation of Frontier Disputes
247pp. Thames and Hudson. £2 10s.

Limited war is a feature of our times, a by-product, as it were, of the chemistry of nuclear deterrence. And, while the conflicts in question either result indirectly from the challenge of communism to the forces of tradition or stem directly from the decolonization process, one common factor, invariably, is a dispute about the delimitation or demarcation of a frontier. (The issue, nowadays, is usually one of frontier definition rather than frontier change.) As evidence of the new stability of European politics, it is noteworthy that since 1945 every case has occurred outside Europe. Examples are the disputes between Cambodia and Thailand, China and India, Egypt and Sudan, Iraq and Kuwait, Morocco and Algeria, Somalia and Ethiopia, Argentine and Chile.

A notable difference from earlier precedents, as Mr. Luard points out in his introductory chapter to this collection of scholarly papers, is that the majority of such conflicts are not *mainly* about territory. Nor do they necessarily involve armed clashes: indeed the very existence of a world forum like the United Nations Organization encourages the waging of verbal battles. What this symposium demonstrates, however, is that there are as many such disputes about territory as ever, and also that the remedial procedures available to the international community are still the same: good offices or mediation in some form (discussed here by an American researcher, Naomi Schwiesov), arbitration (Hazel Fox, formerly Lecturer in Law at Somerville), or judicial settlement (Henry Darwin). In a number of cases a regional organization will fulfil the role which one might have expected would devolve on the U.N.—as in the Algeria-Morocco dispute. In fact, relatively few have been considered by the U.N., let alone successfully resolved.

The League of Nations, as is shown by Stan Windass, a Research Fellow of a Catholic International Relations Institute at the University of Birmingham, was at least as successful as "a catalyst to direct the exercise of power and to modify the course of events".

In his conclusions the editor suggests that we can take some comfort from the fact that in the past twenty years or so the armed conflicts resulting from these territorial disputes have been on a lesser scale than heretofore. There is no guarantee, however, that this will continue to be the case, when and where they include disputes about oil or strategically significant areas. Hence the continuing importance of efforts, whether by the U.N. or one of the regional organizations, to *pacify* (i.e., secure a cease-fire) or to *resolve* a given dispute. The Arab-Israel conflict is shown as a classic example of the many occasions on which the tasks of pacification and of resolution merge into one.

POSTAGE: INLAND 4D. ABROAD 3D.

Europe in counci

OLIVER CRAWFORD:
Done this Day: The European Idea in Action
399pp. Rupert Hart-Davis. £5 5s.

With this exhaustive commentary on the European idea, Mr. Oliver Crawford can justly claim to be in the van of the idealists who want a united, federal Europe. An alumnus of the College of Europe at Bruges, after taking his degree at Oxford, Mr. Crawford writes from a rich experience. (He lived for a time in Berlin, worked for the British Common Market campaign in 1963, wrote a book on Malaya, and then made his way to Israel.) He has had the original notion of taking as his point of departure and his platform not the Brussels Community with its magnetic appeal but the twenty-years-old Council of Europe, which, as the vehicle of the European idea, is customarily left in the shadows. He warns us, however, by the way, that his exposition is to be "deliberately partisan and uncompromisingly federalist". It is none the worse for that—if you believe, as many do, that "the European idea is the most creative idea of our century" and that "its logical imperative is the eventual creation of a European Federal Government for all Europe and in perpetuity". The snag is that in politics, as in life, unfortunately logic does not rule.

Mr. Crawford's method is to isolate and discuss different aspects of his subject in ten substantial chapters, all concerned with the seemingly humdrum activities, past and present, of the Council of Europe, with the emphasis on the sixty-five or so European Conventions concluded under its auspices. (Immediately preceding the dating of each of them, beginning with the Statute, are the words which supply the title of the volume.) There is, of course, plentiful reference to "European" action proceeding else Strasbourg, mainly in Br the author essays a thoughtful disquisition power-relationship betw Council and the Comm recognizes the existence of "dichotomy, even tension" the two organizations—wh ever, will be remedied in the "undeniable strength discipline growing out of the cil's annual Work Program

The author's preachment last and all the time, is the for a *Government* of Eu that it take federal form. Th cil of Europe, by set purpose governments, has, of co federalist features; it is intergovernmental: its one claim to supranationality a human rights field. But i practice, developed, in the C tive Assembly arena, kindre tions; and its spokesmen tended to roll over, spani accept and endorse the pr Brussels. Thus, the recently Secretary-General, Sir Peter ers, as Mr. Crawford points his first major address Assembly on the Orga functions, affirmed in s words that "the problem of unity amongst our Me essentially that of the rel of the rest of Europe, in E.F.T.A., to the European C nities". Mr. Crawford faithf lows this brief.

The book is a curious winded, highly personal tion. It will not be to ev taste; but it has its own merits, not least the author's sionate sincerity. Only, let be duly forewarned that words used by him to descr Preamble of the Council's tute, "uncompromisingly cal in the democratic sense".

Collecting Drawings
Ken Etheridge
A badly needed guide for the new collector into a difficult but rich field. The author is himself a water-colourist of distinction and here he offers invaluable help not only in identification (with the aid of illustrations from the works of 36 artists) but in the mysteries of saleroom practice. Included is a guide to recent prices. *37 photographs.* 0 7135 1579 1 *42s.*

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Physics in a state of flux

RICHARD J. BLACKWELL :
Discovery in the Physical Sciences
240pp. University of Notre Dame Press. £4 1s.

This book proposes an extremely unfashionable view of the philosophical status of physical concepts. It will be hard for the modern person to believe that the universe is as Richard Blackwell argues it is, for Blackwell thinks that there must be some conformity between the comprehending mind and what it comprehends.

His book is hardly the massive work that one would expect to justify such a claim though he sets his thesis clearly and competently enough in the milieu of contemporary philosophy of science. His argument is that all the current accounts of the ontological status of physical concepts fail in certain vital cases and that his way out is the only remaining one that is not demonstrably unrealistic. His case rests on the complete failure of other approaches to find any place at all for the elementary particles of physics. True, he tries to present his case in a general form, but whenever he has a clinching argument it is the elementary particles that are the key to it.

Almost every physicist starts out as a more or less naive realist. If he is philosophically curious he then discovers the liberation that is made possible by a conventionalist view of physical theory. If you have uncritically accepted—for example—that Newton straightforwardly *discovered* the relation between force, acceleration, and mass (the force experienced by a body being calculated by multiplying the numerical value of its acceleration by the numerical value of its mass) then you come with a great feeling of excitement to see that you can use this fundamental relation as the definition of mass, since you can simply make the relationship a tautologically true one by only applying it to cases where it works. (If it does not work, you introduce a new kind of field as a second force on the body, adjusting the value of the new force to restore the original relation exactly.) It is surprising how far you can go on like this, with an exciting feeling that you are pricking the solemn pretensions of the physicists' profession, and yet at the same time making some kind of a voyage of discovery of the sort prophesied by Ernst Mach. It is a relief from an intense claustrophobia to be shown a way to escape out of the intellectually boring simple realism of the experimental physicist.

Then, however, this voyage of discovery comes up against the elementary particles. With them something irreducibly non-conventional asserts itself. The voyage has really begun though—there is no return to simple realism—and one of the apparent ways of fitting the particles into a tidy universe—that of having them as simple objects (albeit of a curious kind) in a simply real universe of physicists' entities—has been shut off for good. Another apparent way out has for a long time been to class the properties of the elementary particles with theoretical constructions, and to argue that it is only by a kind of convention that they are spoken of as objects with properties in the world: it would be said that their "properties" are determined by theoretical requirements, and in the long chains of deduction that necessarily lie between observation and description in terms of particles there is plenty of scope for a gradual change in the ontological status of the "particle" with resulting delusion for the uncritical whose habits of mind lead them to overlook the change.

The elementary particles seem to be "mathematical objects" in the sense that they have simple structure which is not subject to variation. Cricket balls weigh 5¼ ounces—more or less—and if the accuracy with which they are made is poor, then there are difficulties in using them. However the near-equality in mass of the cricket balls has no absolute significance: we can find out in detail just how they get their particular mass in the process of their manufacture and there is nothing to understand. In the case of an electron, however, things are quite different. If there were electrons of different mass in a cyclotron, or in any of a vast number of experimental devices, the most minute differences would show up in an unmistakable way, and they do not. There is no question of the exact identity of mass of all electrons being a *conventional* attribute: the inescapable character of this identity could be an example of what Blackwell refers to as a "dictate of nature". This is a phrase on which he puts a good deal of weight but he does not give the detailed examples that alone would explain the metaphor.

Blackwell's thesis is that a theory of the discovery process is needed to make the ontological status of some physical concepts comprehensible. He arrives at this thesis by asking how has "the primitive mind-nature confrontation at the base of human experience progressively elaborated and extended in the direction of the formulation of scientific hypothesis"? and how do "the dictates of nature and the creative functions of the human mind interact to produce the various types of scientific discovery..."?

We may assess Blackwell on his answer to these last questions, for if we grant him this way of formulating one of the basic questions of the philosophy of science, it is fairly easy to follow his further development of his argument. He postulates an "adaptation" between mind and nature, but has no adequately detailed remarks to make on how such an adaptation could come about.

The modern physical theory which one would expect to provide concepts adequate to the understanding of the physical particle is quantum theory, and one may reasonably doubt whether Blackwell is justified by the existing state of knowledge in quantum theory in assuming as much freedom of action in his inquiry. The answer is—surprisingly—that no adequate general picture of the nature of the particles can be drawn from existing quantum theory, and the field is therefore open. The only philosophical theory which is embedded in the mathematical formalism of quantum theory—that of Bohr's "complementarity", was, thought by Bohr to imply a kind of idealism.

Few physicists ever went that far along with Bohr, but no one could ever consistently deny tha plementarity doctrine upon there being a comple ent and closed "language" matical, experimental an derived from classical ph which and with which could approach the physi At present this assumption is being questioned in man and for a variety of reason there is no conceptual b for physics as a whole.

Blackwell's book being physical, it is surprising author does so little to thesis to any of the great cal philosophers of the writes presumably from a and probably a Thomis ground, and in so far a made a case for science f particular class of me system, it would seem for him not to be too about detailed scholarship to compare the position he to take with that central Christian thought which to reconcile realism with view of the intellect. More would like to know whe Christian metaphysic can acc date the world that Blackw better than, say, some of structions that Russell exp with.

It is likely that the only tory way out for the diffic physics lies in a new scien thesis, not in any metaphys alignment. However, could claim that some meta positions are more likely to a vision of the new field going to be fruitful to and it is certain that those assumed are not doing needed.

Open-air chronometers

FRANK W. COUSINS :
Sundials
247pp. John Baker. £6 6s.

The sundial has one advantage over most other forms of time-keeping. Within the limits of its accuracy (the inaccuracies being caused by wrong setting, the breadth of the style, the diameter of the sun, and refraction) it cannot go wrong; but, of course, what it tells is sun time, not mean solar time or sidereal time, and to know what time to keep an appointment it has to be corrected by the equation of time.

The earliest sundial reported is that of Ahaz, according to Isaiah, say 700 B.C., the earliest of which we have any certain knowledge that of the Chaldaean astronomer Berosus, a hemisphere with a bead at its centre, say 300 B.C. Clocks drove out sundials as essential time-keepers, but like clocks, sundials can be artistic as well as useful, and the erection of Henry Moore's great sundial in Printing House Square is proof that the sundial still fascinates.

Mr. Cousins's book should therefore find eager readers, and it may be said at once that it is a joy to handle and to read. Within its covers the reader will find a large number of beautiful photographs of sundials of many types from earliest days to the present, and admirably lucid diagrams to illustrate the mathematics of the subject—which is neither elementary nor advanced, but mainly a matter of spherical trigonometry.

Mr. Cousins is a consulting engineer who has served on the Council of the British Astronomical Association and is a Fellow of the Royal Astronomical Society. The main mathematical problem is to find the angle between the hour lines on the plane that is chosen for the plane of the dial, whether horizontal, vertical or inclined. Mr. Cousins gives all the material that is needed for the calculations, and many tables, but his explanations are not always as lucid as could be wished. It must also be confessed that in the historical, and particularly the classical, sections he seems a little out of his depth; nor has the proof reading or the indexing always equalled the high quality of the typography and the paper, so that we get such solecisms as cc Virginis in the text and α Virginia in the index and separate entries for Strassburg Cathedral and Strassburg Münster—a too faithful following of the text. These defects do not mean that this is not a good book, but only that, with a little more expert advice and more careful reading it could have been even better.

The third R

IRVING ADLER :
Mathematics and Mental Growth
192pp. Dennis Dobson. 30s.

This new book from the prolific pen of Mr. Irving Adler is a series of essays on education, particularly mathematical education. Most chapters have appeared separately in various journals and this at times gives an impression of lack of cohesion; nevertheless, a thread does run through the book—that recent innovations in the teaching of mathematics and the content of mathematical curricula are eminently justifiable on educational grounds. He argues his case with conviction and clarity and most of the book can be read by the interested layman without undue difficulty, though his illustrations do at times demand some technical knowledge. The book is written primarily for American audiences and references are made to the American educational system, but the book is concerned with issues which transcend national frontiers; indeed, to anyone engaged in teaching mathematics in Britain today, much of what Mr. Adler has to say will have a familiar ring.

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EY HAZZARD :
ay of Noon
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that Miss Hazzard's novel is Naples, about fifteen years ago. eem to tell us as little about it , the house-agent's advertise- of a "spacious and secluded residence" tells us about the e has for sale. And yet, just s flat facts can truthfully e a house and instantly con- its image to those who have , but mean very little to the so it is possible that the men- of Naples in 1950 or so, as the t of a novel by Miss Hazzard, stantly evoke in anyone who d her earlier work a fairly ac- idea of what pleasures to ex- *The Bay of Noon*. Indeed, be- the narrator is herself a lonely, observer recalling, often with odd gaps that memory cannot what took place in that extra- ary city many years before, and ing with a kind of wonder the in which what happened to a her friends seems in retrospect ve involved, perhaps trans- her own life, the whole story even more like some faded. tive snapshot of Naples itself il from one of the early postwar an films which so well charac- ed both period and setting

It is the director of such a film, ni, and the Neapolitan woman r Giaconda, from whose book film was made, whose figures against the battered stucco distant Vesuvius in Miss Hazzard's snapshot. Her young English narrator, Jenny, has arrived in Naples to work on a Nato report, and is, on the strength of a casual letter of introduction, at once taken up by the warm, gracious and passionate Giaconda, whose devotion to a weekend lover—older, smoothly self-satisfied and typically Roman man-about-town Gianni — seems both odd and degrading. Jenny's admiration for Giaconda, whose tragic past and present life of decayed nobility amidst the Neapolitan squalor seems so much a part of the city's fascination, allows her to tolerate, even learn to feel affection for, her fellow admirer in this curious friendship *à trois*. The irony of the situation is that Jenny's self-imposed exile has resulted from precisely such a ménage in reverse —her discovery, after a disrupted wartime childhood, that she is in love with her married brother but can no longer be content with "supplying what was lacking" in his marriage.

Miss Hazzard is, as her admirers will guess, superbly reticent on the implications of all these bizarre relationships. She may be handling a Duchess of Malfi setting and situation, but there are no material corpses or melodramatically contrived scenes. Slowly, against some wonderfully evocative descriptions of decaying palazzi glimpsed down a passage crowded with gaudy stalls, urchins scrabbling below the steep encrusted sea walls, and also against the comic asides about Nato personnel, their PX stores and efficient inefficiency, the pattern of relationships changes. And it is Jenny, by casually bringing together her dry marine biologist J. P. Tulloch, carefully kept at bantering armslength, with her other, Gianni-Giaconda world, who is the unwitting catalyst of drama.

Just as Miss Hazzard is too oblique a writer to provide a tidy—or Websterian—ending to her recollection of things past, so it would seem crude to reveal the new pattern of love which finally drives Jenny from the city she can never forget. It is part of Miss Hazzard's technique to stray tantalizingly from the moment of tension into a Proustian recollection of some apparently unrelated incident which is only later seen as a necessary gloss, a missing piece in the haphazard game of chance. Occasionally, because she is not Proust, her digressions merely irritate with a self-indulgent passage of "fine writing", an overloading of luscious detail or introspective philosophizing. Although it will seem to many readers, accustomed to the overt plain-speaking and speedy economy of current fashion, a novel that ought to have been a short story—or maybe simply, in an outdated tradition—*The Bay of Noon* is memorable and successful in its intention, not only because of what one might call accurate nostalgia, but also because Miss Hazzard has a wry and very quick aptitude for pricking the nostalgic bubble. To be loved, passionately and despairingly, in a moment of crisis, does not prevent her narrator from keeping an eye on the last piece of bread on the plate, and stuffing it into her mouth as soon as the conventions allow.

Clutch trouble

NICOLETTE DEVAS :
Black Eggs.
190pp. Collins. 25s.

One of the many snippets of information which the non-ornithologist will discover from Mrs. Devas's new novel is that her title does not refer to any rare or racial species of egg: "black" eggs are simply those illegally lifted to fill the clutch-cards of private collectors—or to be sold. And of course, when it comes to a party of fervent naturalists on an ornithological expedition to Iceland, the prizes are likely to be rare and lucrative—and to provoke the stiffest sort of in-group suspicions and acrimony. Such an expedition, complete with map and a good deal of detailed travelogue description, provides Mrs. Devas with a splendid basis for writing about her beloved birds and about bird-watching, a hobby which, one learns, is caviare to the general only in the same sense as, say, potholing (lots of wading thigh-deep before breakfast in sewage farms) but not at all in the social sense, since her group includes an ex-Colonel M.P., three little girls and their exotic artist mother, and a young garage mechanic on the run both from police charges and a shotgun wedding.

The trouble is that these characters, and their unexpected holiday relationships, so clearly exist to provide the ordinary stuff of a conventional novel, when what Mrs. Devas is really after is an ornithologist's account of a trip to Iceland. Beatrice, who wanders in her elegant bohemian robes round the spartan hotel, offers a good many fingers of Scotch to cheer the shocked and courtly Colonel's midnight hours, and blandly asserts that her daughters must grow up as unschooled individuals, doesn't care for bird-watching. And it's no good the cardiganned lady teachers or the Professor's wife from Metz sneering at her goings-on, because it turns out not only that she rates enthusiastic reviews by *The Times* art critic, but also nets her stiff-necked Colonel after he's shocked himself even more by giving her a black eye. Yet both he, with his laconic diary in which each entry ends, as on an intercom, with "Over", and the over-effusive wealthy spinster bluestocking, Dr. Chubb, who sets up a bizarre friendship with the loutish mechanic, are quite unconvincing as fictional creations. Which is not to say that such eccentrics are not found, even outside the ornithological world, on the passenger list of nearly any organized holiday group.

Nevertheless, even if the conventional novel form seems unhappily grafted on to an account of the birds of Iceland, Mrs. Devas is by no means a conventionally average writer. Flitting and swooping in fresh and accurate impressions of any scene, giving her dialogue the snatched, authentic pace of experts swapping information, defending prestige, flummoxed by the strangeness of a cold, empty, spartan country and by each other, she successfully conveys both Iceland and the shared enthusiasm for phalaropes. And even those who don't expect to have to consult ornithological reference books to enjoy their fiction should perhaps respect the rarity and interest of a novelist prepared to write, not hypothetically about symbolic human predicaments, but about a world based on factual, and highly expert, observation of a particular—and pleasurable—discipline.

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Movement
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novels both preoccupied with American racial nightmare; the mare rather than the immediate since both stories are set in early 1970s and an anticipated summer which will be long and hot enough to bring an explosion. Mr. Williams this time "open season for oes", while Mr. Garbo quotes thentic ?) F.B.I. pamphlet on ses of mob riots: "We must in mind that frustration breeds ssion on the part of any . . . When the tension has up, when the frustration existed long enough, when or has done its work . . . conditions are ripe. . . . little clash must be regarded spark that can start the conflag- ." Mr. Williams also calls his "a novel of some probability" Mr. Garbo, wordier in all has a "Statement from the or" where he invokes Benjamin lin to make it clear that he, rites in a vein of admonitory

Williams's central figure is e Browning, a professional campaigner goaded on from easy, opportunist moderation ecisive violence. Not that the of *Sons of Darkness, Sons of* is entirely credible. Browning that a New York cop who urdered a black youth without punished must die, so he hires at eccentric sub-branch of the to "make the hit", telling his ed contact: "I'm getting older I haven't made any waves, I n't made anything better. It's ng late." He pays for the killing dollars talked out of rich Negro born sympathizers in a fund- ng tour supposedly for the Insti- of Racial Justice, the rather ering reformist body he works The cop is duly put down by a ah Israeli freedom-fighter, and aftermath quickly escalates into national burn-up-and-destroy. thought. The simple selec- violent act, calculated to deliver a message, had become magnified. All the black populace he had been trying to save from slaughter looked like it was being slaughtered after all." But not, Browning himself nor, oddly, most of the protagonists. They all seem to get away (as though Mr. Williams is providing a creator's sentimental immunity for the characters he has grown to like).

Sons of Darkness, Sons of Light does not quite have the convincing intensity of Mr. Williams's earlier novel, *The Man Who Cried I am*. Here there is too much undressed coincidence, convenient relating and engineered response for the fiction not to loom heavy—a process abetted by Browning being an altogether less tragic, more unhappy and merely weary figure than Max Reddick in the previous book. Writing this one was thus probably more difficult, and if the effort shows there is still plenty to admire. The sociology of those drawn into Browning's adventure is sometimes over-ingenious but usually winning at the same time. It may seem unlikely that both the retired Mafioso and the Israeli mercenary should have had their deepest ties with Negro women: but this and even cruder stratagems actually enrich the book in their awkward fashion, because Mr. Williams has sufficient strength of feeling and of insight to support a shaky fabric.

Mr. Garbo is, by comparison, a doughty worker on stony ground. Certainly he leaves no stone unturned and the labour tells on the reader. The 400-odd chapterless pages of *The Movement* cover only twenty-nine hours, and, like a conscientious watchman's log, they leave hardly a minute unaccounted for. It is the momentous night and day when the students take over their vast Michigan campus, led by "an ancient wisp of a woman, a once world-famed psychic" and a militant senior (symbolically *half*-black), with results similar to Browning's initiative. In the end, the "Establishment", able to stop at nothing in self-preservation, jet-bomb the victorious but ground-trapped rebels.

Mr. Garbo's research was doubtless total, his detail is remorseless and his "fairness" towards his characters impressive. Scarcely anyone is denied repeated motive exposure via rostrum or hefty thought-balloons. Even the baddies, like "red-faced, paunchy and myopic Security Officer Hinkey", have their elaborate say. It is all faultless, impregnable—and it ought to be compelling, too. But whereas Mr. Williams manages to suggest a society, Mr. Garbo has built a film-set.

Frozen fixations

THOMAS KENEALLY :
The Survivor
282pp. Angus and Robertson. 30s.

There is a curious imbalance in *The Survivor*. The book revolves around one man's obsession—forty years previously, Alec Ramsey was one of the survivors of an Antarctic expedition during which Leeming, the leader of the expedition, died. Ramsey's debilitating sense of guilt has lasted four decades, and is intensified by the news that Leeming's body is likely to be discovered, preserved by the ice, and disinterred. A short-lived affair with Leeming's wife, shortly before the expedition, had provided some of Ramsey's guilt, but it seems that more sinister things might come to light should Leeming's corpse be recovered. Strangely, Ramsey's preoccupation with all this, backed up by flashbacks to the expedition itself, is not as convincing as it might be.

In other, less extreme directions, however, Thomas Keneally brings his characters very much to life. He is determined—and rightly so—to admit the complexity of the day-to-day emotional lives of Ramsey and those involved with him, but refuses to indulge them, or himself. His tone is often wry, sometimes faintly cynical, but his purpose is always investigatory, so that, for example, a sexual scene between Ramsey's wife and a randy lecturer is made quietly funny, but at the same time mildly pathetic and even a little cruel. It is a fine and truthful balance; writing beside which the accounts of Ramsey's supposedly powerful obsession seem pale.

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Making sense of what we see

R. L. GREGORY:
The Intelligent Eye
191pp. Weidenfeld and Nicolson. £2 10s.

This book is something of a tour de force. From its origins in a series of Christmas Lectures at the Royal Institution which the author delivered in 1967-68, it has grown into a semi-technical monograph on the physics, physiology and—above all—the psychology of vision, much of it built around the author's own work. While now aimed at adults rather than schoolchildren, the book still conveys something of the infectious enthusiasm which must have both delighted and inspired his youthful audience. Indeed its author is probably the only man since the great Helmholtz who has succeeded in investing the staid subject of geometrical optics with a touch of magic!

The earlier part of the book is mainly concerned with how we see objects and pictures—how, in fact, the brain makes use of the eyes in gaining information about the external world. This approach to perception is very different from the traditional one, which has concerned itself almost exclusively with the analysis of sensations and their correlation with the receptor systems of the eye and brain. Professor Gregory is much more concerned with answering Koffka's famous question, "Why do things look as they do?"—and indeed he takes his initial cue from Gestalt psychology, though he does not pursue it for long. While the answer of the Gestalt psychologists was essentially in terms of inborn "forces of organization", Professor Gregory is much more interested in the "hypotheses" which the brain builds up as a result of experience and makes use of in interpreting the visual world. Here, again, the example of Helmholtz is paramount.

Professor Gregory has much to say about perspective, stereoscopic vision, and the differences between objects and pictures in relation to perception. Much of this is based upon his own experimental work, and although somewhat technical is lucidly expounded and beautifully illustrated by photographs and diagrams, many of them being 3-D stereo illustrations. (The publishers have thoughtfully provided a pair of stereo spectacles with each copy of the book.) He shows convincingly that what have hitherto been regarded as trivial visual illusions—e.g., the reversing "Necker Cube" or the "impossible objects" of Professor Penrose and others—may in fact hold the key to how we actually see objects in tri-dimensional space. His work on the mechanisms underlying illusions may indeed herald a breakthrough in the experimental psychology of perception.

In later chapters, Professor Gregory turns to some rather more general implications of visual perception and its relation to the visual arts. For example, he has some interesting things to say about Egyptian figure drawings, in which there are characteristic distortions due to lack of representation of depth and to features perceived from different standpoints being embodied in the same design—e.g., a full face view of the eye in a profile. As he points out, somewhat similar confusions are not uncommon in children's drawings and it is a pity he does not follow this further. For example, there is evidence that the salient features of children's drawing appear in the drawings of blind no less than sighted children, suggesting that lack of depth and confusion of planes occurs in the representation of haptic no less than visual space.

Of great interest are Professor Gregory's views about the "hypotheses" set up and tested by the brain in arriving at the nature of the objects in the visual world. As he sees it, perception is a kind of problem-solving and involves betting on the most probable interpretation of sensory data, in terms of the world of objects. Where "hypotheses" are inadequate or faulty, various types of error or illusion result. These may on occasion have grave consequences. For example, incorrect estimation of size or distance caused by interpretation being based on the most "probable" size of an object at a given apparent distance (or most "probable" distance of an object of a given apparent size) may, in circumstances in which the "usual" cues are either absent or deceptive, give rise to serious errors of judgment. In some cases, indeed, they have been implicated in road and aeroplane accidents. By and large, however, Professor Gregory argues that the brain is "intelligent" in its betting, for the most part achieving an interpretation of the visual world in good agreement with reality.

Yet at moments Professor Gregory sounds a more sombre note. As he points out, an incorrect hypothesis may for long falsify the data of direct observation and perpetuate incorrect interpretations of the external world. Indeed he gives a number of examples in which astronomical observations were for long falsified by lack of a "correct" hypothesis, most notably in the case of Saturn's ring, which does not appear to have been "seen" as such un true nature had been appa

More seriously, Profes contends that the advance has led increasingly to repre of the world in symbo transcending direct expe its representation by pictor Further, modern techn mands ways of seeing, ha ordering objects altogether from those imposed upon biological origins. "As we Professor Gregory concludes must adapt to what we have the danger is that we may world beyond the restrain intelligence: a world we ca

Like so many brillian this book is not without Its very brevity renders and its very zest disarmin critic. Yet it should be Professor Gregory gives space to the work of others should happen to fit in with picture of the visual world Professor James Gibson's example, obviously merits here). Nor does he deal with areas of the utmost impor his subject, such as the rol movements in perception or out" of the visual fields on the cortex. Naturally, not everyt be included in a short (and cratic) book but at least might be expected to give indication of what ha excluded, and why.

None the less, this book brilliant and immensely sti It conveys the real exch immediacy of research and be more remote from the worthy essays in sci science. Its author has ea gratitude of all who persist the antiquated belief that the tion of education is to originality.

Measuring what we are

HANS J. EYSENCK and SYBIL B. G. EYSENCK:
Personality Structure and Measurement
365pp. Routledge and Kegan Paul. £3 3s.

Professor Eysenck has the pleasant habit of dedicating each of his numerous books to an appropriate precursor or pioneer. Having at various times thus indicated debts to Kraepelin, Jaspers, Pavlov, Galton, Watson, Thurstone and Hull, he now makes similar acknowledgement to Charles Spearman. Spearman was mainly interested in the measurement of intelligence, and his narrow views of temperament precluded durable study of personality by him and the majority of his pupils; but his use of the tetrad equation for the factorial analysis of mental abilities set in motion a large body of stimulating research by such men as Cyril Burt and Godfrey Thomson in this country and L. L. Thurstone, J. P. Guilford and R. B. Cattell in America.

Professor Eysenck has, during the past thirty years, played a very prominent part in elaborating the factorial concept and building it out into a theoretical system of wide scope. The advent of the high-speed electronic computer enabled him and his collaborators to apply factor analysis to all the items in large multifactorial inventories and questionnaires, not only of his own series but also Cattell's and Guilford's: such an undertaking would have been insufferably time-consuming and tedious in pre-computer days. The result is not an unmixed blessing; it produces what the authors justly call "massive sets of data", and it compels Professor Eysenck to depart at times from his longstanding avowed effort to "eschew meretricious sesquipedalianism". He is as a rule admirably direct and plain-spoken, but the technical language suited to this statistical theme can be too much for him; he tells us, for example, that a particular method "was used to find an orthogonal similarity transformation to tridiagonalize the correlation matrix".

Factorial analysis stands or falls by the statistical procedures employed. These are intricate and varied. Mathematicians tend to look askance at them, and Professor Eysenck himself concedes that in purely statistical arguments there is a fatal degree of subjectivity which makes decisions arbitrary and subjective rather than compelling. Hence the diversity of conclusions arrived at by different investigators. This divergence, however, is to some extent lessened and accounted for by the comparative findings recorded in this latest book.

Guilford and Cattell have attended mainly to the isolation of primary factors or traits, whereas Professor Eysenck has concentrated on two higher-order factors (or types): extraversion/introversion, and emotional instability (or neuroticism). These two higher order factors which are clearly evident also in Guilford's and Cattell's data, do not vary in accordance with age or sex: primary factors do vary and are difficult or impossible to replicate. Professor Eysenck rejoices at the good behaviour of his higher-order factors which "emerge with credit from our studies", and deplores the unhappy state of the primary factors:

> they are half-arbitrary, half-accidental conglomerations of items sharing functional equivalence only to a limited degree and thus quite unfitted to bear the burden imposed upon them by their originators. . . . It is our contention that here too [in the furtherance of personality theory] it is only the higher order factors which have been found to be capable of integration with our existing knowledge of psychological and physiological fact.

Integration with physiological fact in this context, it turns out, amounts to stating a theoretical standpoint according to which introversion is a product of cortical arousal, mediated by the ascending reticular activating system, and characterized by lower sensory thresholds than are found in extraverts. This postulate was examined more fully three years ago in the companion volume, *The Biological Basis of Personality*; but whereas it was then put forward with tentative caution, it is now presented confidently, buttressed with five "proofs".

More than 500 articles a year deal with personality in its manifold psychological aspects: one of the most distinguished authorities describes this abundant output as a disconcerting sprawl. Certainly many who write on the subject prefer breadth to depth, and are far from observing the full rigour of the game. Professor Eysenck is not one of the sinners in this regard. Bent on defending and exemplifying the necessity to use in any scientific study measurement, experiment, and testable theoretical constructs, he and his wife have, with their colleagues, assembled findings and arguments which demand the most serious and respectful attention. That is not to say that they are free from the tendency to reify abstractions, and make excessive claims, or that factor analysis is the beginning and end of wisdom in research into personality: as Cyril Burt put it,

> the specific factors of the modern psychologist are simply abstract constituents deduced by statistical analysis; it is conceivable that they have no more concrete existence than the north and south poles or the lines of latitude and longitude upon a map.

But Professor Eysenck is impressively aware of the weaknesses in his armour and both ingenious and untiring in his efforts to repair them. He bears witness to the compelling force of Francis Galton's declaration that the character which shapes our conduct is a *definite* and durable "something", which it is reasonable to try and measure.

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ore in it than meets the eye

WADDINGTON:
Appearance
of the Relations between and the Natural Sciences Century.
Edinburgh University Press.

a series of lectures which at Aberystwyth some six ago, Professor Waddington's —that being what it looks with its many reproductions serif text—is primarily a of the relations between science and various schools twentieth-century painting. The one that has often been on by artists and critics, since they seldom give the sion of knowing what they ing about, or how to express ly, it is immensely valuable e it sorted out by someone ers.

ardly, the form adopted is of an art history, at least of selected movements which to the author to reflect what "the kind of understanding non-human real world with science is concerned". As the book is not wholly satis-y; mainly because innocent s may forget how much Professor Waddington is deliberately ng out, but partly also because history is not his speciality and s some things wrong. The sition, even on the "art" is that he is a lot more ent than any art critic, and perhaps enjoys pictures rather Half the pleasure for the scientific reader will be the of meeting a first-rate sceptic and harnessed to a sensitive and Professor Waddington for le on Ben Nicholson's evolu-since 1945.

ghly speaking the plan of the is this. Painting between 1910 the Second World War divides within schools: the Geometers, from the cubists to latter-constructivism; and the Magi-comprising not only Chirico the surrealists but (very rightly) mystical element in Kandinsky. many qualifications, these re-the impact on the one hand of Newtonian physics and the dis-n of the apparently solid on the other that of the ries of Freud.

a new school arose, cen-New York between 1945 which seemed rather to the indeterminacy, multiplic-ody forms and tangled pat-of our current scientific s of the world: the "Third " of the physicists, biolo-A. N. Whitehead, and the ter men, with its emphasis on of organization and the interrelatedness of observed and observer. The wide ramifications of this neatly coincidental third approach to painting are traced out over about half the book, taking in such developments as kinetic and op art, hard-edge abstraction and the mathematically-based structures of Max Bill, as well as the mournful figures of Giacometti (which are seen as "coming very close to the world-picture of modern physics") and various forms of pop art (which are generally dismissed).

Since this second half of the book is a good deal more subjectively written than the first, it would be a pity if it were taken as bestowing some kind of "scientific" accolade on the artists whom the author likes:

> In my opinion, what the Op artists are doing is sufficiently interesting in its own right for an instinctive movement of sympathy on the part of scientists to be not inappropriate . . .

The trenchant scepticism which he applies in the first half to some of the artists' most hallowed scientific pretensions—to the cubists' acquaintance with the "mathematician" Princet, for instance, or Apollinaire's remarks about the Fourth Dimension, or Duchamp's Green Box, or Worringer's influence on Kandinsky, or Klee's pedagogical writings—becomes charitably suspended after 1945, when he often seems to be taking painters' statements at their face value.

In one way he is absolutely right about artists: that they have a healthy uninhibitedness about reading and discussing scientific statements which they are unequipped to understand, and that this gives them a basic access to science sadly lacking in the more self-defensive and introvert literary man. But a lot of what they themselves consequently say is pure smoke-screen, vitiated by the commercialization of "personality" which the art traffic has encouraged over the past two decades. They are not in any way like scientists explaining their methods; in fact it is very noticeable that hardly any painter ever sits down honestly to describe just what he does, but rather what he thinks, or what he thinks he thinks, or would like other people to think he thinks. The approach to words is quite different. Accuracy is not a factor.

At the same time Professor Waddington rather exaggerates the "newness" of post-1945 painting. Obviously he is aware how almost all its formal innovations are rooted in some previous experiment—e.g., by Malevich or the Dadaists or the pre-1914 Kandinsky—but by concentrating only on Geometricizers and Magicians, and omitting such huge figures as Bonnard, Matisse and the later Braque and Picasso, he makes it seem much more of a higher synthesis than historically it was. He also takes what seems an optimistic view of its scientific relevance by the emphasis which he places on two of its main features: the "all-over" character of its canvases, where something is going on over the entire area and there are blurred edges to the shapes, and its exploitation of chance operations.

The first he sees as "connected in a very profound way with the recognition that the world is a continuum of interlocking and mutually dependent activities"; the second as "clearly connected" with indeterminacy in physics and chance mutations in biology. But surely that is to say in effect either that the real world is a totally irrational muddle or that the paintings of Pollock and the activities of John Cage are definitely not. Leaving aside the fact that there are many other types of "all-over" art—from a Brueghel to a piece of wallpaper—it seems a mistake to assume any great similarity between the scientists' view of a jumbled and at some points inexplicable world which we none the less try to make sense of, and the erection of anti-rationality into a principle backed by strong mystical feelings. It is one thing to recognize the impenetrable, quite another to add to it.

The criterion of scientific relevance is not entirely constant, since although Professor Waddington sees nothing illuminating in the artist's reproduction of visual images culled from science a number of his own illustrations suggest analogies with these (e.g., Pollock with a drawing of electron density contours) and he deals with several who specialize in more or less identifiable allusions to the trappings of technology (like Léger or Paolozzi) as well as comparing the elegance or simplicity of certain works with the equivalent qualities in mathematical formulas: a rather desperate kind of link. But basically what he looks for in an artist is some recognition at the unconscious, pre-creative level of the way in which contemporary science tackles the non-human world, and hence for actual works of art which are likely to suggest new ideas and approaches to the scientist.

This in itself is more limited than the very comprehensive, pluralistic view of science and mankind which he outlines in his last short chapter, and all along there seems a certain inconsistency in his readiness to take into account the evidence of biology while arbitrarily excluding the human from the relevant concerns of art. One of the most interesting of the many stimulating ideas which he throws up throughout the book is that the conversion of other kinds of experience into visual images "often makes it easier to recognize the characteristics of their organization", but he has no use (at least in the present context) for those artists who take a wide variety of visual, symbolic and written elements and order them into a new rich communicative network—as Steinberg and Kitaj have done—often thereby expressing otherwise inaccessible relationships in a way which might conduce to that.

It is almost as if it were more useful to re-create confusion than to suggest ways of showing its structure—which would imply in turn that the latter was no longer the artist's job.

There is no great gulf to be bridged between the cultures, in this eminent geneticist's view. He sees human life today rather as made up of countless more or less specialized overlapping sub-cultures, which will never be organized in a single comprehensive system, and quite rightly so. What is needed, then, is "to facilitate and encourage lively interchanges, controversies and co-operations" between them, since nothing—in art, science or anything else—can be of more than limited relevance until it is absorbed also by non-specialists. "There is therefore", says the author, "a very definite place for books by 'outsiders'"; and undoubtedly *Behind Appearance*, with its wealth of fresh insights and judgments, proves this to be the case. Admittedly some hard questions are posed by a section of the last chapter called "The Crunch", where Professor Waddington gives a special place to the scientists' contribution on account of its insistence that "some things are true and others not" and its conviction that the results of human inquisitiveness and experiment have to be faced, however unpleasant they may be. Here, he understandably feels, the artists stop short (and the philosophers and literary men, by implication, even shorter). All the same:

> Man does not only haunt many various worlds; he lives simultaneously, at one and the same time, in worlds which are distinguishable, but not truly divided. He cannot produce anything which has solely an aesthetic impact and no conceptual meaning; nor anything which is purely scientific without providing any basis from which aesthetic creation is possible.

The unspoken moral of the whole exercise—and it is one that has a particular relevance to this issue of the *TLS*—is that it is in the undefined areas of overlap between such worlds that the worthwhile new ideas arise.

logged keyhole

AUL CRESPELLE:
and His Women
ated by Robert Baldick.
Hodder and Stoughton.

book, which adds little to our edge of Picasso's life or standing of his art, and con-no information not available here, first appeared in French . The basis on which it has strung together involves a gim-in doubtful taste: the idea of g "a living portrait" of o in terms of the women who successively shared his life. the publication of the French al, which was little noticed in , the author has added a , in which he claims that his fall of hitherto unpublished is a result of his having to draw on "the testimony himself, his friends and relatives", many of whom know well".

The author's lack of familiarity with this milieu may however be measured by the fact that he admits to not having talked to Picasso himself nor even to Mme. Jacqueline Picasso, who has been the artist's constant companion for the past fifteen years, while he refers to his nephews as "Jaime and Fin Picasso" instead of as Fin and Xavier Vilato. Nor, significantly, does M. Crespelle include in the list of those people with whom he claims to have talked the names of such close friends of the artist as Edouard Pignon and Hélène Parmelin, Manuel Pallares, Renato Guttuso, Christian Zervos, the brothers Crommelynck, Mourlot or David Duncan. The photograph of Picasso's house, the Château de Vauvenargues, is identified as his home, Notre-Dame-de-Vie at Mougins, and vice versa, while Olga Koklova, his first wife, is said to have danced "the little American Girl" in *Parade*. Such elementary errors are not infrequent, and they undermine the reader's confidence in the text.

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The moderate polymath

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John Wilkins 1614-1672
333pp. University of California Press (I.B.E.G.). £4 11s.

Anglican bishop and theologian, Warden of Wadham College, Oxford, scientific experimenter and author of books hovering between science fiction and science fact, politician and preacher, scientific organizer and encyclopedist, and inventor of a universal language, John Wilkins lived a life in which he came near to being all things to all men. (To Oliver Cromwell, for example, he became brother-in-law.) Not a great intellect, but something of an intellectual catalyst, he had a talent for steering a middle course, which in Good King Charles's golden days, and after, was not altogether an unwise course, as the song reminds us. An adherent of the Pym group who could become retainer to a nobleman and then the Protector's brother-in-law was bound to draw criticism, and much of this came from the High Church quarter. He was criticized by those who were opposed to the new science, but more men of science took his side than attacked him, and he has been a natural choice for those who, like Robert Merton, Dorothy Stimson, and Christopher Hill, have argued for a causal relationship between Puritanism and scientific advance. This extension of the Weber-Tawney thesis that religion is a determinant of economic and other material conditions appears most plausible when the religious categories into which men are divided are fewest. As Professor Shapiro argues very cogently, to accept the Puritan/Anglican dichotomy as absolute is to begin moving down a slippery slope which ends by our taking all non-Catholic Englishmen except the Laudians as Puritans. She also observes that the dichotomy obscures the existence of a broad middle category of divines, scholars, and politicians, who sought mild reforms in the church, to be achieved by moderate means. The moderates, with a foot in both camps, included in their number most English scientists of note.

This "intellectual biography" of Wilkins is successful in that it catches the character of one such moderate—doubly difficult when writing of a period when most vocal men were extremists. In science as in religion, Professor Shapiro presents a well-balanced case, particularly in regard to the widely canvassed Baconian myth. Wilkins like Bacon—and like a great many others—saw that science could be used to lessen men's labours, but to say as much was neither to be profound nor to provide an explanation of why all who then studied the sciences did so. The realization did not account, for example, for the formal, contemplative, and intellectual pleasures taken by Wilkins and his scientific contemporaries; but here we are in danger of following the book too closely, and failing to draw sufficiently fine distinctions within the realm of what goes as "science". The habit of mind which led a man to perform experiments might have been one which also led him to invent mechanical gadgets, or it might have been the product of a mathematical or astronomical bent. But to use the word "science" to cover everything from the world of the gadgeteer to that of the mathematician is to accept an unfortunate modern confusion (comparable with that which the author exposes in the Puritan Science debate, although now no large thesis rests upon it). Sad to say, Wilkins—notwithstanding his biographer's enthusiasm—was no great shakes as a scientist in most senses of the word. As an experimenter he was a dabbler. His early broadsides in favour of Copernicanism were successful in drawing the popular attention to some of the principal points at issue, but he played an insignificant part in the advance or profession of astronomy. Like Kepler, to whose *Somnium* he was greatly indebted, Wilkins used the idea of space travel as a means of propagating the ideas of Copernicus, but it is doubtful whether Wilkins, unlike Kepler, could have given a very complete account of the "new" system, let alone of subsequent developments in the subject.

Wilkins stood for a liberal and open attitude to the dissemination of scientific knowledge. His *Essay Towards a Real Character and a Philosophical Language* supports the claim, as does his part—much exaggerated in this biography, even so—in the foundation of the Royal Society. The supposed secrecy of the ancients he deplored, for he decried the idea that potentially dangerous knowledge should be suppressed, since, after all, "nothing hath more occasioned Troubles and Contention than the art of Writing". The *Essay Towards a Real Character* should probably be accounted Wilkins's most important work. It was well received by a number of writers with similar ambitions, including Leibniz, Locke, Comenius, and the nineteenth-century philologists A. J. Ellis and Max Müller, and it is unfortunate that the biography gives the reader an insufficient idea about its contents or historical significance. In a sentence, it might be said that the "philosophical language" had a structure resembling that of R *Thesaurus*, which was indeed in by it, while the symbols of the universal character", resemb a first glance the symbols of b shorthand, signify not wo "things and notions". But t to say nothing of the ingenu even depth of what is a long w considerable subtlety, concep ing not only what was scholas impeccable, but such diverse t as Mohammedanism and p pudding. There is still scope f close study of the efflorescen this subject in seventeenth-c England, regarded as a mean the ways of philology and log

If this "intellectual biograph more a history of intellectu rents than of specific argume scientific concepts, it is no worse for that. In the wri scientific history, at least, such as this—which is as much a graphy of an epoch as of a m provide welcome relief fro Great Man and Great Idea so beloved of scientists them The human dimension is cer not lacking. Although Wilkins's "real character" is portrayed w out the excessive use of anec one story bears repeating. A walking towards a statue in the den of Warden Wilkins, heard statue command him to "goe p the Gospel in Virginia".

The voice amazed him, and at the return it repeated the same wo another return it said Ashwell, g 3rd and last time, goe preach the G pel in Virginia.

Ashwell, very frightened, Wilkins of the voice from hea and Wilkins in turn calmed him explaining how, with the help o long tube to the statue's mouth, had produced the effect. Then, Oxford's most beautiful spoke the latitudinarian experim and writer of science fiction. he spoke in English was a rel on Ashwell rather than on him

Nelson's daughter

WINIFRED GERIN:
Horatia Nelson
350pp. Clarendon Press: Oxford University Press. £3 5s.

So many hands have recently been at work on material relating to the liaison between Nelson and Lady Hamilton that the odds were in favour of the production of a full-scale biography of their daughter Horatia, who lived until 1881. Considering the gush which has, in the past, been added to Nelsoniana, it is a pleasure to state that in Winifred Gérin (who lately added to the understanding of Charlotte Brontë) Horatia has found a writer of whom she herself would surely have approved. Winifred Gérin is an exact, sympathetic and realistic annalist who has worked with full cooperation from descendants of her subject.

Familiar as some of the story of Horatia Nelson Ward already is, the book provides a number of surprises. Chief among them is that Nelson and Emma Hamilton had three children, not one. Horatia, born in 1801, had a twin. This sister may well have survived after being taken into the care of the Foundling Hospital, so that Nelson may have many direct descendants who will for ever be unknown as such. The remaining child, who arrived in 1803 when Nelson was in the Mediterranean, did not live. Reflecting upon the difficulties into which the mother was falling, that was perhaps as well.

The next biggest surprise is the speed and completeness of Emma's demoralization after Nelson's death. The reason is plain: she had no head for finance, no pre-vision, no ever-present male hand to steady her. Theoretically, she had been adequately provided for by Hamilton and by Nelson; moreover she had friends of both sexes who were consistently kind during the rest of her life. They would have been of practical guidance had she more often allowed this. But she grew increasingly feckless and was by far her own worst enemy, at times indeed her only one. "No one", she wrote on November 29, 1805, to George Rose, "shall ever see a letter of my glorious and dear departed Nelson." A few years later, her careless guardianship of missives which Nelson bade her destroy had ruined her reputation and grievously shaken his. And even during her precarious last days at Calais, redeemed from complete misery by the child Horatia's ceaseless attention, her drink bill was £77, which was more than she laid out on the necessities of life.

Horatia never knew who her mother was, or if she did, from the evidence of letters shown to her, she refused to believe it. This was understandable, so much had she suffered in early life, and it is notable that while she retained justifiable pride in her father, and gave his Christian name to one of her sons, none of her daughters was called Emma. Writers such as Walter Sichel and Mollie Hardwicke have done justice to the earlier years of a remarkable woman: later phases show her at her worst, including the cruel repudiation of a daughter born in the days of a "giddy" youth, the unfortunate Emma Carew, condemned to a "painful employment" (perhaps, like Charlotte Brontë, as a governess), followed by permanent obscurity.

Hard beginnings had a happier sequel. After Emma's death Horatia was cherished by Nelson's delightful sisters. She married a clergyman, Philip Ward, who was in every way estimable. She loved him deeply, supporting him through many trials. In the 1850s efforts were made, encouraged by the Prince Consort, to honour a legacy "to the beneficence of my Country" referred to in the eighth codicil to Nelson's will, written and witnessed just before Trafalgar. Horatia's family duly benefited. She herself died at Pinner, blessed in her children, the survivors of whom were flourishing. It was a quiet end to a very varied life. The account of her quest for information concerning her parentage, and the material this brought to light, is not the least enthralling part of a work which befits an admirable subject.

The slight qualifications necessary to put forward about a book whose appearance is most gracious concern matters of detail. In general, the editing is scrupulous, though a number of repetitions could have been eliminated with advantage, and the index, though most useful, is incomplete. The author has elevated Sir William Hamilton from ministerial to ambassadorial rank, a process for which he himself strove in vain, but she has demoted Captain Codrington of the Orion to lieutenant at Trafalgar; his medal, incidentally, was that given to all post-captains present at the battle. It is also doubtful, in view of Emma's haphazard supervision of her studies, whether Horatia could really speak five languages, even haltingly. But such trifles weigh nothing in comparison with, for instance, the startling impression conveyed by a photograph of Horatia in widow's weeds looking the image of her father.

Now more than a century old, Gilbert J. French's *Life and Times of Samuel Crompton* (299pp., Adams and Dart, 40 Gay Street, Bath, Somerset. £2 10s.) is still held to be the best biography of the inventor of the spinning mule. When he wrote it in 1859 he was still able to draw on the memories of old people in Bolton who remembered Crompton—the diffident genius whose lack of business acumen deprived him of the rewards of his invention. This new edition carries an introduction by Dr. S. D. Chapman of Nottingham University, who employs his fifteen pages chiefly to describe something of the early background of the cotton industry, a subject that receives small attention in the biography itself.

CZECHO

Thoughts of a
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eems an odd choice to go taigne and Pascal as a r of the self, but such a is really beside the point. denthal is interested in three beings, Frenchmen, writers, ppened to live in successive s, who, like so many others, the study of human behav- scinating and whose respec- sonalities afford a conven- s for looking at their times. hree essays, of roughly equal come close to what the call *la petite histoire*. ve is more prominent than o Montaigne's reflections on d his friendship with La are duly enlisted alongside tude to witches (sceptical d his services to the monar- dest diplomacy).

respect Pascal comes off a ne; we are told that women no part in his emotional life asonably enough) that it is pe to read into his corre- nce with Mlle. de Roannez t of love, for which he was y case temperamentally un- that he had no sense of and that in his last months bled the aged Tolstoy in m for the poor. Richelieu, s and the Fronde, however, is to enliven an otherwise hat sombre narrative.

r returns with Diderot: lit- with the Salons at the figuratively with a robust : Café society in Paris, ine's court at St. Petersburg, mondains like Bernis, *philo-* Rousseau (on the face of it a better candidate for full-length treatment than Diderot himself), thumbnail sketches of *Le Neveu de Rameau* and *La Religieuse*, not to mention the *Encyclopédie* all form a vivid backcloth to the tumultuous life of the instrument-maker's son from Langres. Now Goethe, now Thomas Mann (or Tolstoy) is brought in to point up a comparison, this century and then that are contrasted with our own. It is all great fun and (as the jacket announces) rich in colour, wit and anecdote. The average German reader, anxious to know something about three great Frenchmen but unable to read French fluently enough for enjoyment, will find this book a stimulating introduction. Both Pascal (in the *Lettres Provinciales*) and Diderot have been described as journalists, and it is no disparagement of Dr. Friedenthal's lively and well documented volume to call it, too, high-class journalism. It may not do for academic purists, but it was not written for them.

M. Pouilloux's challenging little book adopts a very different and deliberately disconcerting approach to Montaigne—or rather to the *Essais*. He has some harsh things to say about the many critics who try to extract maxims and eternal truths from the *Essais*, or to impose an order on their willed disorder. According to him disorder is the whole object of the book, and reflects the multiple levels of Montaigne's enterprise. Like Montaigne, the reader must abandon the quest for the essence of things and concentrate on how they appear at different moments, and why just so, he must look at himself looking at his own opinions. Montaigne's frequent switches of pronouns (from *je* to *on*, *nous* or *ils*) is part of the irony and circularity of a work in perpetual motion. As a corrective to recent critical excesses this is not unwelcome, but one wonders what Montaigne himself would have made of it.

arly stages

JEFFERY:
Renaissance Comedy 1552-
Clarendon Press: Oxford
y Press. £2 5s.

d deal has been done in ears to awaken interest in Renaissance tragedy, but for reason the comedy of the has been largely neglected. was a spate of publication of bout a hundred years ago. e then only three or four have been edited and the subject of sixteenth-century has been very much the of specialists. Now, with ffery's study of the best co- from Jodelle's *L'Eugène* to 's *Mélite*, students of or indeed any Renaissance , can readily discover the characteristics of the tradi- hich Corneille claimed to volutionized and with which has such obvious affini-

Jeffery begins by discussing rces and models available to dele and their successors in ble genre. The element of with its almost invariable in- , has remained strong in comedy from the Middle to the present day, and from too came the predilection for abic verse (though a few es were written in prose). fluence of Terence, and the derived from commentaries author, was the main contri- from antiquity, and from 1570 the activity of Italian troupes made a decisive on French comedy. Oddly Italian influence is to h in dramatization of episodes from Boccaccio and Ariosto as in translation or adaptation of actual Italian comedies. A second chapter examines, both from pictorial and internal textual evidence, the nature of the stage and the performances. All the plays considered seem to have required from one to four compartments, consisting in every case of a town house fronting on to a street. On the vexed question of whether there was a major break in stage décor with Serlio, and again with Mahelot, Dr. Jeffery cautiously inclines to the unorthodox view that there was essential continuity from the Middle Ages to the seventeenth century.

The third chapter, comprising about half the book, deals thoroughly and lucidly with the conventions involved. Dramatic theory, plot, character, unity of time, are among the main points discussed. The uninformed view that Italian influence produced stock characters no more individualized than those of a Punch and Judy show is convincingly refuted: the stock characters, though never very profound, are in fact used as a basis for quite significant variations. As to the plot, deceit and disguise prove to be subsidiary to the main structural device, which consists in the removal of obstacles to some usually amorous design. While the comedies, like most French Renaissance literature, have their fair share of sententiae (mostly in the form of proverbs) they aimed, as Dr. Jeffery puts it, "at delight rather than moral reform". Properly produced they could still no doubt be enjoyable. The hard-pressed student (and teacher) will particularly welcome the synopses of twelve of these plays which conclude this elegant and scholarly volume.

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Words and space

EUGEN GOMRINGER :
Worte sind Schatten : Die Konstellationen, 1951-1968
Edited by Helmut Heissenbüttel.
305pp. Hamburg : Rowohlt. DM 20.

Eugen Gomringer, the Swiss-German founding father of the European branch of concrete poetry international, was born in Bolivia ; it was in his native Spanish that he began to write his "constellations" in 1951, having turned experimental after reaching a dead-end in the traditional sonnet-form. He has acknowledged his early debt to Mallarmé—who ended, in "Un coup de dés", by making the surface space of the page into an intrinsic element of his poetry (compare Henry Moore's appropriation of space in his sculpture)—and to the verbal and structural innovations of Arno Holz. His use of the term "constellation", which he has defined as "a [verbal] play-area of fixed dimensions", appears to derive from Mallarmé, though no doubt it also reflects his admiration for Hans Arp, who both wrote "constellations" ("poems with a limited number of words which appear in various constellations") in the 1930s and produced many "constellations" and "configurations" in relief/assemblage form ; more generally the term is a characteristic one in modern art, as in Miró's cycle of 23 "Constellations", 1939-41.

Gomringer had in fact considered calling his experimental poems "concrete" before he chose the more exact and accurate term "constellations" ; but when he met Décio Pignatari at Ulm in 1955, it was agreed that the work of Gomringer and of the Noigandres group alike should be known as concrete poetry. Concrete poetry as such was then officially launched in 1956 at the National Exhibition of Concrete Art in São Paulo : two years later the Noigandres poets published their *Pilot Plan for Concrete Poetry*. It is important to stress that concrete poetry as an international movement only dates from 1955 ; concrete art, on the other hand, with which Gomringer had been familiar since his childhood, was named by Theo van Doesburg in the first and only number of his periodical *Art Concret* in 1930, and was the subject of a number of exhibitions in western Europe in the late 1940s.

Concrete poetry as such owes much to the concrete art of Hans Arp and its poetic counterpart, and to Dada—as in the pre-concrete picture-poems of Lajos Kassák and the sound-poems of Theo van Doesburg. Gomringer himself is clearly also indebted to modern information theory (he, too, aims to compress information into the simplest possible form), and to the work of Max Bill, who designed the cover for the present volume; from 1954 to 1958 Gomringer worked as Bill's secretary at the Hochschule für Gestaltung, Ulm. In 1959 he founded the Eugen Gomringer Press which has since done much to propagate concrete poetry, particularly in the successive numbers of *Konkrete poesie—poesia concreta* (1960-64).

Worte sind Schatten collects the "constellations" that first appeared in half-a-dozen volumes from 1953 to 1965, and supersedes the earlier collected volume *Die Konstellationen*. It includes twenty-three visual and forty-three audio-visual poems, the "Book of Hours" series, a number of texts in Spanish, French, English, and Swiss-German dialect, and the—rather less successful—"constellations in book form". Also included are Gomringer's various theoretical writings as previously collected in the "serielle manifeste" series, plus his most recent essay on the early days of concrete poetry (first published in English in *Form* 4, April, 1967), together with bibliographies of his own work and criticism of it. It is the combination of texts and theoretical writings that make this excellently designed and printed collection so useful. In recent years Gomringer's lyrical and purist pioneering work may have been rather overshadowed by the more advanced experiments of other writers, but he has a firm place in the history of what is now, thanks to him, an international movement.

Words and nature

F. W. LEAKEY :
Baudelaire and Nature
382pp. Manchester University Press. £2 15s.

It is obvious to every reader of Baudelaire that nature occupies a prominent place in his work, the prose as well as the poetry. The difficulties begin as soon as we try to arrive at a precise definition of his attitude or to trace its evolution from the early to the final works. The main difficulty lies in the poet's own inconsistencies and contradictions. It is increased by the fact that many of the poems can only be dated on internal evidence and by the structure of the *Fleurs du mal*. It is fashionable at present to play down the "architecture" of the work ; but whatever the critics like to think, the poet himself never ceased to regard it as a matter of capital importance. This means of course that the order of the poems was decided entirely by their themes, without the slightest regard for the date of composition. The result is that in the second edition of the *Fleurs du mal* we find two early poems used as the opening and closing pieces of "Tableaux Parisiens". Baudelaire made a few alterations in the first of them, but they both appear to reflect an attitude to Nature which he had abandoned a good many years previously.

Mr. Leakey distinguishes seven different phases in Baudelaire's approach to Nature which he labels "Nature Beneficient", "the Nostalgic Primitivist", "Nature idealized and 'moralized'", "the Repudiation of Nature" (signalled by the well-known letter to Desnoyers of 1853-4), "Nature and Symbol", "Nature without Man" and what he calls "the Nihilist Solution", which is illustrated by an excellent analysis of "Le Voyage".

The later phases are the most difficult to disentangle and reveal what Mr. Leakey describes as "the essential *ambivalence* of Baudelaire's attitude" as exemplified in such lines as "Je te hais autant que je t'aime" and "Je t'aime autant que je te hais". He is particularly helpful in his discussion of the effect on Baudelaire's attitude of his insistence on the doctrine of original sin, in his analysis of the poet's symbols and in what he has to say about his concept of the supernatural, which he regards as purely subjective and relates it to the attitude of the surrealists.

A prodigious amount of study and research has gone into the making of Mr. Leakey's book. He quotes extensively from all the texts that illuminate his subject, as well as referring us to a number of other articles he has contributed to reviews and *Festschriften*. The footnotes are daunting both in number and length. Nevertheless, this is a source-book which should prove valuable to anybody seriously interested in Baudelaire's attitude to Nature.

Words pure

NOEL PERRIN :
Dr. Bowdler's Legacy
296pp. Macmillan. £2 15s.

This excellent "history of expurgated books in England and America" could not have been published in this country ten years ago. Or, at any rate, not in its present form. Mr. Perrin would have had to expurgate it, thus enfeebling both its scholarship and its polemic bite. To be sure, the freeing of the printed word and the weakening of taboos have made possible the publication of a good deal of tasteless trash in recent years. But this is a small price to pay for literary freedom, whose benefits include so delightful and informative a volume as *Dr. Bowdler's Legacy*.

These benefits also include, or are likely to include in due course, editions of English classics shorn of the prudish cuts and emendations of several generations of expurgators ; anthologies whose readers are at last told that "verteth", in the thirteenth-century *Cuckoo-Song* ("Sumer is icumen in . . ."), refers to crepitation, not "browsing in the forest" ; dictionaries which include the "four-letter words" and deal with them scientifically. Of course, as Mr. Perrin demonstrates, the battle for honesty is not yet won : old expurgations are still being reprinted, new ones are still being made, bowdlerized texts are still being printed accidentally, and an enormous number of expurgated books still remains on home and library shelves. So "it will be a long time still before our picture of the past has its warts fully restored". Nevertheless, provided that the new drive against pornography does not make policemen the arbiters of what can be printed, we may soon be able, without undue difficulty, to read what Herrick, Pepys, Smollett, Zola, and even Rochester actually wrote.

If the pressure-groups succeed, of course, it may be a different matter. That danger is what makes Mr. Perrin's book such a timely and welcome contribution to the debate. Though the vastness of the field has made it necessary to be selective—Shakespeare's plays alone have been bowdlerized at least a hundred times, *Gulliver's Travels* almost as often—*Dr. Bowdler's Legacy* is a mine of accurate information, well organized and lucidly presented. The opening chapter in particular, on "The Causes of Bowdlerism", is a masterly summary. The principal cause, according to Mr. Perrin, was the cult of delicacy (part of the vogue of sensibility and sentiment), which held that young female readers must be protected from knowledge of evil, delicacy, like virginity, being something you can lose only once and never recover. Other causes were the rise of evangelical religion, and of Methodism in particular ; the industrial revolution ; and of the general reading pub only fault to be found w etiological chapter -- pretty only fault in the whole its failure to mention an early nineteenth-century group, the Society for the sion of Vice, whose suppor cluded Mrs. Trimmer, three of the Bowdler family, and the bowdlerizer the Reverend Plumptre, and which, in 18 it unsafe to put any book hands of youth unless every been previously examined.

Mr. Perrin brings out essential dirtymindedness of expurgators as they have pencilled their way through literature, removing "every can raise a blush on the modesty". Touchstone's

He that sweetest rose will find
Must find love's prick and Ro

—was deleted by the Bo William Chambers and Rob ruthers, in their *Household of the Dramatic Works of Shakespeare* (1861), changed word :

Must find love's "thorn" and R

Miss Rosa Baughan, in 1863, old Capulet's playful refere ladies' corns ; even sore feet delicate. Dr. Benjamin Boo in the *New Family Bible* dropped the word "belly" changed a girl's navel "waist". Leigh Hunt would the Manciple snarl at the "Thy breath full sour stin but had him say: "Thy br resembleth not sweet marjo Thomas Bowdler found the ingly harmless words "to do" the mouths of Pandarus and C sida, "unfit to be repeated", "it would be better to omit than to explain them". Ph suggested that "I don't ca d——m", in a sailors' song, be changed to "I don't mind bam" ("bam" being a slang for hoax).

And so it went on, the more pulous expurgators omitting ing expressions more or less getically, the less scrupulous changing them, often absurd late as 1925, the *TLS* revie Hugh Macnaghten's *Poem Catullus*, complaining that would guess one poem was ad to a young man, wrote: Macnaghten has printed *Juventi*, and thereby destroy only interest the poem had better to omit it altogether."

Mr. Perrin does not pre sexual bowdlerization is the most interesting or most ant variety, and he points to ency in the United Sta bowdlerize on racial grounds high-school text of *Huck Finn* "a nigger woman" "one of the servants", "a white gentleman" as "a gentleman". Delicacy never simply changes its form.

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The Language of Science

BY H. C. LONGUET-HIGGINS

AT PEOPLE the word "ience" means television , moon landings, heart s, drugs, atomic bombs ruthless exploitation of For such blessings and nce must share the credit credit, and there is no comment on the respon scientists to the commu large. But few non have any idea how scien work and think, or stand more than a few of any scientific paper knew where to look ween the scientists and is fixed an intellectual cannot be crossed with preparation and final initi the priesthood of the

wonder, then, that the pes e an opposition between es: a humanist culture, for traditional values and acy of the individual ; and c culture, which seems to g humanity by the hair barbarism. But has there a time when all the of a community spoke the guage and accepted the losophy? And is modern ally a single culture, or as d as societ y itself ?

is said to have attrib human troubles to the language. Axes and atom can change the material ut only language can alter ideas. In the history of tion, science will ultimately ed by its effects upon our nd the universe and our ; and we can only under ce by studying its con the language in which epts are framed. Concepts building-blocks of scientific and the birth of any new heralded by the creation concepts, and words by represent them.

words enter the scientific vocabulary as technical terms—incomprehensible to all except the inventor and a handful of his colleagues. Most of them are short-lived, and are soon buried deep in the coal seams of the scientific literature. Those which survive find their way by degrees into common speech. Like new members of a large society, their presence is often unnoticed to begin with. Each of the five or six scientific revolutions of the past 200 years has injected into our language words which we use freely, but without acknowledging their origin.

The weather forecast predicts tomorrow's atmospheric pressure, temperature and humidity. We are given to understand that an astronaut can withstand five but not ten times the force of gravity. We are shocked to discover that Piltdown Man was not one of our evolutionary ancestors. We note with interest and concern that a high proportion of convicted criminals have three rather than two sex chromosomes, and that many schizophrenics display an abnormal protein metabolism. We express strong opinions about public expenditure on high-energy physics and may or may not be reassured by the discovery of new elementary particles. We learn with misgiving about transferable drug resistance in pathogenic bacteria, and question the wisdom of squandering our antibiotics on animal foodstuffs. We scratch our heads about how to dispose of the radioactive waste from nuclear power stations and about the effects of chemical pollution on rivers and on marine life. We argue hotly about technical aids to teaching, such as closed-circuit television and computer-aided instruction ; and we blissfully ignore the possibility that our brains and bodies may be seriously damaged by tobacco, L.S.D. and oral contraceptives.

It is difficult to realize that many of the words in the last few sentences did not even exist a few generations ago. This is clear evidence that science has made a difference not only to the world but to the way in which we talk about it. But how seriously should we take this fact ? Is it just that we like to seem to keep up with the times, or is there more to it than that ?

It would of course be silly to claim that when an ordinary person uses the word "temperature", for example, he understands the full meaning of the word. Warmth and cold are the names for primitive sensations, but temperature is quite a sophisticated notion, based on the existence of thermometers. We take it for granted that the readings of two thermometers will agree when they are placed in the same cup of tea, and this implicit belief in objectively measurable quantities has exerted a profound influence on human thought in the past few hundred years. It has even led some thinkers to reject as unreal anything that could not be measured objectively, with implications that undermine the very idea of measurement. But the concept of temperature goes still deeper than this. What is it that distinguishes an accurate thermometer from an inaccurate one ? One of the major achievements of nineteenth-century science was to answer just this question, and the answer came from some hard thinking by an engineer, Sadi Carnot, about the efficiency of steam engines.

Carnot realized that because heat can be used to generate power it might be possible to construct a perpetual motion machine by transferring heat from one body to another and back again. Conversely, if perpetual motion machines were impossible to construct, as Carnot suspected, this fact would carry wide implications about the convertibility of heat into work. These implications are summed up in the Second Law of Thermodynamics, the only law of physics which has never been seriously challenged. The rigorous statement of the Second Law is needed for the definition of absolute temperature, just as Ohm's Law is needed in order to define electrical resistance. The precise definition of temperature thus requires unusual clarity of thought and expression, qualities which are rare even among scholarship candidates. To ask, with Lord Snow, that every educated person should be able to state the Second Law of Thermodynamics with genuine comprehension is to ask for the impossible.

So although many scientific terms have found their way into everyday language, in doing so they have left behind most of the hard thinking which underlies them. In this respect, perhaps, scientific terms are no different from those of theology or politics, where words such as "salvation" or "democracy" are notoriously liable to misunderstanding. The only cure for such ills is to teach science better, and there is no shortage of helpful suggestions how this might be done. But is science itself as exact and consistent as such advice might seem to assume ? Is the language in which scientists talk to one another so clear and comprehensible as all that ?

Even those standing on the sidelines must realize that a crisis of

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communication has arisen within science itself. The problem is not merely one of quantity, although the figures are startling enough. There are now something like 33,000 *scientific periodicals* which are deemed worthy of attention by the scientific section of the National Lending Library for Science and Technology, and the number of such periodicals has doubled in each of the past few decades. A typical scientific periodical may publish something like 100 articles per year, each running to four or five thousand words, so that literally billions of words appear in print every year.

This torrent of verbiage has raised the "noise level" in the scientific literature to the point at which it has become virtually impossible for any scientist to attend to all the significant work in his subject. Add to this the fact that most of the published literature is written by people with little or no skill in expressing ideas, and it is a wonder that the resulting babel has not brought science to a standstill. Some people seem to think that "computerization" of the scientific literature—whatever that may mean—will eventually cure these ills. But nothing short of a miracle will be able to change a situation in which more than 90 per cent of all scientific papers remain unread by anyone except the author.

In this mad rush to "publish or perish", how do working scientists maintain their intellectual balance? By largely ignoring one another. Everyone knows that only a minute *fraction of published science* is worthy of his attention, and asks his friends in the "invisible college" whom he should talk to, and whose papers he should reach. (Things are not quite so straightforward in the world of technology, where an army of scouts must be kept posted to pick up every discovery which might be of commercial value; but even here any inventor with a promising idea is likely to try and draw someone's attention to it by a personal approach.)

For better or for worse, then, the scientific world is an elitist society, just like the world of the arts or of entertainment. Just as a Picasso nude deserves more attention than one by John Lennon, so a paper by Francis Crick is likely to contain better ideas than one by Wilfred Snooks—and everybody knows it. But if Snooks is really a budding genius, it will not in fact take very long for his ideas to attract attention, provided that he is not exiled in some obscure mountain village or monastery. The neglected Mendel is, we devoutly believe, a rarity in these days, and even Mendel finally made the grade.

The process by which new ideas establish themselves in science is not fully accountable in traditional terms. A simple view would be that new scientific ideas enable us to answer questions which were previously unanswerable. This is part of the truth, but a more important property of new concepts is that they enable us to ask questions which could not even be asked before. Before the theory of evolution no one could even ask about our animal ancestors. Before Einstein it would have seemed ridiculous to raise the question whether the temporal order of two events was a matter of opinion rather than objective fact. Perhaps a more recent and less familiar example may illustrate the point.

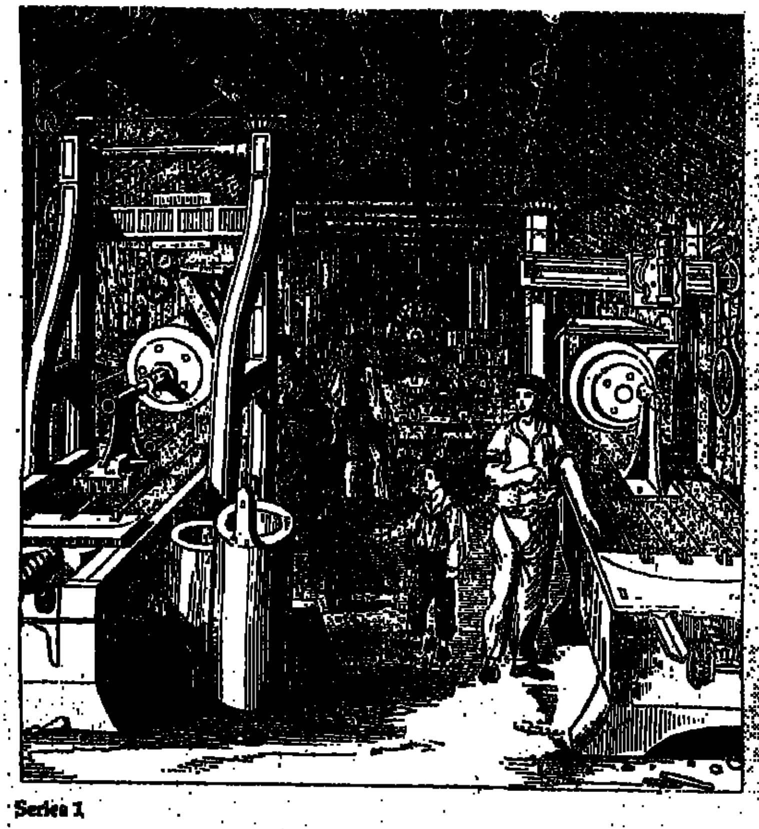
Most chemists are proud of the fact that "chemistry is an experimental science". In a trivial sense this is undeniable; the raw material of chemistry comes from experiments and observations on real substances, which may or may not be of commercial or biological importance. But the same could be said of cookery—an admirable occupation, but hardly a science. The difference is that chemistry is not an isolated study—a law unto itself—but part of an intellectual edifice designed to express our understanding of the whole material universe.

The famous Scottish chemist Couper hit the nail on the head more than a century ago with the words: "The soul of chemistry is its theory." What keeps chemistry alive, apart from its commercial utility, is our urge not only to observe but also to interpret what happens in the test tube or in our bodies; our interpretations form the subject matter of theoretical chemistry. In Couper's time the concepts of organic chemistry were simple and self-contained; the organic chemist saw himself as a grown-up child fitting molecules together out of balls and springs (though the inorganic chemist was having to think a quite different way about acids, bases and salts). The balls were the indivisible atoms of the physicist, and there was no point in inquiring about the springs—the valency bonds between the atoms—because at that time physics had no room for such a concept.

But the growth of atomic physics soon shattered this innocent dream, and the early simplicity of chemical theory seemed to dissolve into mathematical abstraction when Schroedinger and Pauli gave the first accurate account of the electron, which underlies all chemical phenomena. It was hard *going for* the poor experimentalist, who was quite unused to such strange concepts as "spin" and "energy level". There followed an undignified rearguard action in which the experimental chemist, fearful of becoming clung to the precious fa the new concepts could he hoped--account for. A guished professor of chemistry was ridiculed by leagues for setting an question on a compound chemist had been able to But the chemical physic breed of men brought into the quantum theory--were sharpening their swords battle of the next decade, atmosphere changed abru they suddenly began to accepted views about the of known substances, and fully to predict chemical which had previously escape tion.

In terms of the new questions were raised—and which could not even be posed a few years earlier. copper sulphate pale blue?" have been a silly question decades before, as there chemical concepts bearing questions. Now it could answered by appealing to the of "allowed transitions" "energy levels". But the lution was not so much answering of difficult and heaven knows there plethora of ghastly directed to this end—but possibility of asking them. Only now that the over is it commonly the real contribution of the chemistry has been its without which we could raise many important issues.

Even within science, guage is paramount. out language and the enshrines it is difficult how science could have being, though primitive might perhaps have developed out it. It has been suggested that our claim to biological tion should really rest on to communicate linguistically than on any claim to wisdom; that we should the ironical title "homo the more accurately "homo loquens".



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Victims of the Colonels

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the 1820s, the cause of freedom Greece has a particular fascination for the liberal establishment in Europe. Everyone loves the colonels and three years the coup the storm of protest no sign of abating. An enterprising political sociologist could an illuminating study of the ordinary effectiveness of the lobby in ensuring that receives more than its fair attention in the media. One factor that helps explain all is that those elements in society that have been hardest the colonels are the politicians, professional classes and the intel-. Seldom can the émigré of a régime have appeared ing, assured, articulate and or with so many influ- friends and contacts in the

has been more outspoken in her opposition to the régime than Mrs. Vlachos, refusal to publish her influ- conservative newspapers was the first major acts of defiance the junta, a defiance which resulted in house arrest. In *Arrest* she provides a charac- lly lively account of her and ultimate escape and uses as a peg on which to hang a remarkable description of the coup itself, of the circumstances of her refusal to publish *Kathimerini* and *Messimvrini*, an interpretation of the explosive political climate of the mid-1960s, and a series of vignettes of her journalistic and social activities in more peaceful times.

Those who experienced the April 21 coup will recognize at once the authenticity of her account, with its emphasis on the air of unreality and apparent unconcern that pervaded Athens. Her description of the alternate threats and blandishments of the colonels in their efforts to get her to publish is fascinating, and those who have followed the remarkable career of Mr. Theofylaktos Papakonstantinou from communist to leader writer on *Messimvrini* to the junta's minister for the press will find much to reflect upon.

On the background to the coup Mrs. Vlachos stresses an important point which is too often overlooked in all the loose talk about "fascism" in Greece. This is that the colonels were prompted to strike more from personal than ideological motives. For it has been clear from the outset that this regime has no ideological basis other than a sterile anti-communism and a vague commitment to the "ideals of helleno-Christian civilization" (whatever these may be). Rather they acted because they were terrified at the prospects of a Centre Union victory in the elections scheduled for May 28. For the Papandreous had made it clear that victory would have resulted in a determined effort to bring the army under political control. An inevitable consequence would have been the retiring of ultra-rightists such as Papadopoulos who had already attracted attention with trumped-up charges of communist sabotage in his tank unit and was already receiving, as Mrs. Vlachos suggests, psychiatric treatment. She might have added that Papadopoulos's psychiatrist was one of Greece's leading amateurs of bibliography.

Much else in Mrs. Vlachos's account of recent Greek history is similarly perceptive and one can only wish that she had chosen to give us more of her unrivalled knowledge of the intricacies of the Greek political scene and less chit-chat about Athenian high life, where everyone seems to be of "good" or "excellent" family, with the exception of poor *Stavros Niarchos who is merely* "bourgeois". Instead she tantalizes us, amid accounts of youthful encounters with Clark Gable, with such fascinating revelations as that Queen Frederica personally cabled to Athens an account of her harassment by leftwing protesters in London in 1963, while a somewhat bemused Mrs. Vlachos was expected to give this story splash coverage in her papers.

Mrs. Vlachos writes English with the vigour which we have come to expect from her. Colonel Ladas, the régime's self-appointed hard-liner, is described as a "sickly kind of ape"; nor is she much kinder to pre-coup political opponents. It may have appeared to Mrs. Vlachos from her sixth-floor suite in the Kathimerini building "incredible" and "unfortunate for Greece" that the "two Papandreous, son and father" (note the order), succeeded Karamanlis in 1963.

Observers less *parti pris* than Mrs. Vlachos might well consider the 53 per cent majority given to the Papandreous as entirely "credible", given that the electorate was faced with the alternative of a government which had shown itself almost totally unresponsive to the growing demand, fourteen years after the end of the civil war, for dismantling the institutions of the "para-state" by which the traditional right, of which Mrs. Vlachos was such an influential supporter, had sought to perpetuate its hold on power.

Just how repressive the last years of the Karamanlis era were is chillingly conveyed by Vassilis Vassilikos in *Hors les murs*. As we might expect from the author of *Z*, this collection of articles, essays and short stories, which were originally published as newspaper articles before the coup, are compulsively readable. Particularly moving is his account of the plight of the political prisoners incarcerated since the civil war and subjected to a continual barrage of propaganda and persuasion to get them to sign the hated "declaration of repentance", an essential precondition of their release. The plight of their families was in many ways even more desperate.

Vassilikos documents with depressing thoroughness just how many other Greeks missed out on the Karamanlis "economic miracle": the scavengers who scratched a living from the municipal garbage dumps; the underemployed rural proletariat forced to take advantage of that traditional safety-valve of the Greeks, emigration; the politically suspect unable to apply for a driving licence, let alone a passport, because they lacked a "certificate of social reliability". And throughout the book there broods the appalling tragedy of the murder of Lambrakis, which more than anything signified the moral bankruptcy of the Karamanlis era.

One of Pericles Korovessis's tormentors, Inspector Lambrou, liked *to impress upon him* his continuity in office, the fact that he had been "interrogating" communists for twenty-five years, serving under all postwar Greek governments. Korovessis's *The Method* brilliantly portrays the sullen and mindless brutality of his torturers, whose mental attitudes had been fossilized in the climate of mutual atrocity of the civil war period. Nor can the horrifying record of his treatment be regarded simply as an isolated case.

For the findings of the European Commission on Human Rights, before which Korovessis testified in Strasbourg, amply demonstrate that torture in Greece is an "administrative practice", sanctioned at the highest level. Korovessis writes extremely well and is well served by his translators, who manage to capture the gutter language of his inquisitors. *The Method* is one of the classics of interrogation and deserves to stand comparison with Alex Weissberg's account of his treatment by the Soviet G.P.U. in *Conspiracy of Silence*.

Accounts of torture also figure prominently in Nicole Dreyfus's *Les étudiants grecs accusent* and in Denis Langlois's book. Much of Me. Dreyfus's book consists of a transcript of the proceedings of the trial of students alleged to belong to the student resistance group Rigas Feraios. The students were accused of little more than cyclostyling proclamations, and much of the trial was concerned with general questions of political outlook.

This revealed, as Me. Dreyfus points out, not so much a gap between generations as a fundamental difference of world-view, typified in the obsessional anti-communism of the public prosecutor, Liapis, who incidentally distinguished himself in the recent Trial of the 35 by an anti-semitic outburst directed at Jules Dassin. The statements in their own defence of many of the students, who received sentences ranging from twenty-one years downwards, make impressive reading.

M. Langlois's book is rather wider ranging, although inevitably a good part of it is devoted to Panagoulis's trial. Many aspects of Panagoulis's attempt on the life of Colonel Papadopoulos remain to be clarified, not least the role of the assassinated Polykarpos Georghadjis, whose resignation as foreign minister of Cyprus was a direct consequence of the trial, but M. Langlois does provide a useful summary of the present state of knowledge of this complex business. Reading the account of Panagoulis's behaviour at his trial one can well understand how he has come to be regarded as one of the authentic heroes of the Greek resistance.

Constantine Tsoucalas in *The Greek Tragedy* is not concerned with the present situation in Greece but rather with setting the coup in historical perspective. It makes a refreshing change to have available in English a serious and cogent analysis of modern Greek society written by a Greek, and thus free from the distortions of romantic philhellenism or that even more interesting phenomenon, dyspeptic mishellenism, that characterize so much English writing on the subject.

His analysis is thought-provoking and often plausible, although, given the paucity of serious research into many aspects of Greek social, economic and political history, much of it must in the present state of knowledge remain speculative. And more than once one is left with the impression that the *facts of Greek history* are being forced into an ideological mould into which they do not quite fit.

In parts the book is tendentious and downright inaccurate. This is particularly apparent in its account of the wartime resistance. Admittedly, what one might call a British Military Mission orthodoxy has dominated most writing in English on the communist controlled E.A.M., by far the largest of the wartime resistance groups. But can Mr. Tsoucalas be serious in his claim that Colonel C. M. Woodhouse, the head of the B.M.M., was parachuted into Greece with the prime objective "of breaking E.A.M. politically"? And it is not "irrelevant", as Mr. Tsoucalas suggests, to try to assess whether the disastrous internecine strife between the different *guerrilla* groups was started by communist or republican-controlled guerrilla groups?

But where Mr. Tsoucalas carries most conviction is in his account of postwar political developments and in particular the crucial events of the 1960s. Especially persuasive is his estimate of the new balance of political forces that emerged from the Centre Union electoral victories in 1963-64. A point which he particularly stresses is the appearance of a radicalized wing of the Centre Union in the mid-1960s under the leadership of the small but influential centre-left group of western-educated technocrats and intellectuals that looked to Andreas Papandreou as their political figurehead, much to the alarm of certain sections of the traditional Centre Union leadership. It is as a reflection of the ideology of this centre-left group, which might well have emerged as a significant political force in Greece had not the colonels forestalled the May 28 elections, that the book has its greatest value. As such it is required reading for anyone seeking to understand the background to the present crisis in Greece.

Problems of Political Philosophy

D. D. Raphael

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D. D. Raphael is Professor of Philosophy, University of Reading.

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THE TIMES

T·L·S

69th Year 7th May 1970 No. 3,558

Science communicated

As readers may have gathered from Sir Solly Zuckerman's article, the theme of this special number has a dual significance. To begin with there is the general problem of communicating scientific results, ideas and modes of thought both within the scientific community and to the layman (who may be a highly qualified specialist in some non-scientific field). This has long concerned thinkers in both categories, and only a fortnight from now the French section of Unesco chaired by Dr. Pierre Auger will be meeting at Nice to discuss such topics as the need for qualified interpreters between scientist and public, the concept of the "two cultures", and the risks involved in the treatment of science as news.

But it must be also clear to any regular reader of this paper that a good few subjects get more regular and extensive treatment than the natural sciences. In fact this is to some extent a reflection of what publishers put out and send for review; moreover the very function of a book to the scientist is not what it is to the historian or literary scholar, let alone the creative writer (though not all that unlike what it is to the artist or musician, whose primary spheres are likewise non-verbal). But we feel that there are worthwhile scientific books which we fail to get for review because we are imagined not to be interested, and that on top of this we ought possibly to make a special effort to expound and criticize current scientific work.

The point of this would be partly to even up our own and our readers' mental balance; partly that scientists need to be judged before a non-specialist audience; but above all perhaps to give that audience some appreciation of what so many of the best minds in the modern world are up to. With any subject, no matter how specialized, it has long been our aim to discuss it as clearly as possible, but on a level of expertise that the comparable expert in a wholly different subject would not find insulting to his intelligence. But we wondered whether we were doing enough to apply this principle outside politics, the humanities and the arts, and we looked back with some interest at the first years of the century, when the *TLS* published occasional science articles, for instance three on the nature and uses of radium in the summer of 1903.

Certainly it was easier in those days to see all learning (or all discovery) as one, but precisely this suggested that it might be important to try to maintain a unified vision in our own fragmented times. We decided accordingly to ask a number of eminent modern scientists what they felt about the problem, with the intention of acting on their advice. Among those whom we consulted, *Professor Sir Rudolph Peierls* (Oxford) suggested that the expository scientific book was now gaining a new role in science thanks to the information explosion (graphically described by Dr. D. J. Urquhart on page 519), which now makes it difficult

> to follow what goes on in other branches of one's subject, and more so to keep even moderately informed about other related subjects.
>
> This is a serious problem, because excessive specialization endangers the healthy growth of knowledge and can easily lead to missing the wood for the trees. In this situation it is more important than ever to have access to good and clear expositions of the state of knowledge at many levels, ranging from reviews for experts in one branch of a subject to broad and readable literature for the non-experts.
>
> The tradition in science is to place the highest value on original work and to look down on expository writing as an inferior activity. This attitude needs correcting, because today the writer of a clear review or monograph, who helps others to find their way through a maze of research publications, may do more for the growth of his subject than he might do by unearthing a new, but minor, fact or inventing a new little device. Fortunately there are signs that this is being recognized, and more good books and reviews are being written; but this in turn creates a problem for each person to find the particular books or articles he should or would want to read. This is the place where good reviewing can be of great value.

"Scientific communication between scientists", so *Professor Denis Gabor* (Imperial College) told us, "has never been more intense, nor has it ever been more difficult.

> Many mature scientists have simply given up reading journals. This has not done much harm to their creativity. One of the most universal of theoretical physicists, Dov Landau, left it to his senior students to read journals, and to report to him, and he was only one of many. Others rely on conferences, and they are more interested in the conversations in the lobby than in the lectures. Frequent visits to laboratories are even more important: the aeroplane has jumped in where the journals failed by their indigestible mass. But next to the spoken word, books have become second in importance. By what is almost a miracle, there are still enough studious and ambitious young and middle-aged scientists, who undergo the ordeal of collecting every scrap of information on a limited subject, and put it in a book, though they know that it is likely to become obsolete in a few years. There is therefore an important place in our system of scientific communication for informative and critical book reviews. . . .
>
> Second, what about the educated man or woman with a non-scientific background, who would dearly love to keep up with science? Not all humanists are narrow-minded addicts to the First Culture. Hundreds of them still visit the British Ass or the Royal Institution, but one can well understand that there are too few of them, at a time when even reading the *Scientific American* requires a considerable intellectual effort. But many thousands of these humanists read the *Times Literary Supplement*, and by engaging the best popularizers of science, of which this country has a remarkable number, it may be possible to cater to their needs.

Dr. I. J. Good, author of the article on page 513, expanded this by drawing a distinction between the type of scientific journalism which is "addressed to the level of the school science teacher", and popular books on science for the intelligent layman. Feeling that there is not much reliable journalism in the latter category, he suggested

> that it is here that the *TLS* might fill the gap and thereby bring the "two cultures" together. This it could do in two ways: by reviewing scientific books at all levels, and by bringing the main results of research to the popular attention but not in much detail. If this is done with the same integrity that is generally shown in the literary book-reviews I think an important public service will be performed.

But opinions about the popularizers differ. Thus it was pointed out to us by another correspondent that

> In the Bernal-Haldane-Waddington era the pace of professional science was slower and it seemed possible for leading scientists to develop worthwhile views on the cultural relations of science. Today it is very difficult to know where to go. On the one hand there are the somewhat journalistic people who tend not to think very deeply and have, in any case, only a superficial knowledge of science (even if they are working scientists). On the other hand, really good scientists are not too difficult to find but they have done little thinking about broader issues.
>
> The very important problem . . . is, in my opinion, trying to place science properly in relation to human activities and in our culture. At the moment, as you know, there is marked fragmentation in our culture and science is very isolated. Most of the attempts to bridge the gaps are irrelevant or carried out so inadequately that they fail. What is needed is a great deal of new thinking, but unfortunately there really isn't much going on which is worthwhile . . . . We need to get clearer the value of science today and its human and cultural implications. Most of the writing on this by the best scientific minds today is on a disappointingly inadequate level.

If this view suggests that the scientist himself stands to gain by having his activities looked at in the wider context, the *Director of the Royal Institution* argued conversely that: "The communication gap is serious, not because it slows the development of science, but because it has led to a situation where the greater part of mankind is ignorant of mankind's greatest activity.

> Part of the trouble is the feeling commonly held that science is something apart. Why not drop the word "science" altogether and give your theme as "The Communication of Knowledge"? It means the same thing but will be better understood by those who think that there is some sort of difference between science and knowledge.

Professor Sigurd Zienau (University College London) once again thinks that we can be of use in both directions, for he sees us performing "a most useful countervailing function against the increasing fragmentation of science.

> In doing so, there is no room for bemoaning this facet of the subject, which is not solely the result of increasing specialization but reflects deeper contingencies. What is required are workmanlike attempts to draw together strands of argument, insight and methodology as they arise out of the daily work of the scientist. The kind of thing I have in mind is what you do so very successfully for the field of ideas in general: a very typical example, your recent three-page evaluation in depth of "Dialectical Methodology". It is perfectly possible to spark off a quite analogous dissection of some endeavours in professional science through the vehicle of book-reviews. For instance there is the attempt, possibly premature, to create a Theoretical Biology and infuse it with the exact discipline of theoretical Physics. . The trap to be avoided in this connexion is the reviewing of the ever-increasing flood of didactic and teaching books and aids: these have their use but are best handled in connexion with education. . . .
>
> The *TLS*, of course, already has its place of honour as a medium for the evaluation of those ill-defined borderline areas between science, society and history. What is within your scope is a break-through into what used to be called "Natural Philosophy". In promoting this you would gain the thanks of the scientific community at large.

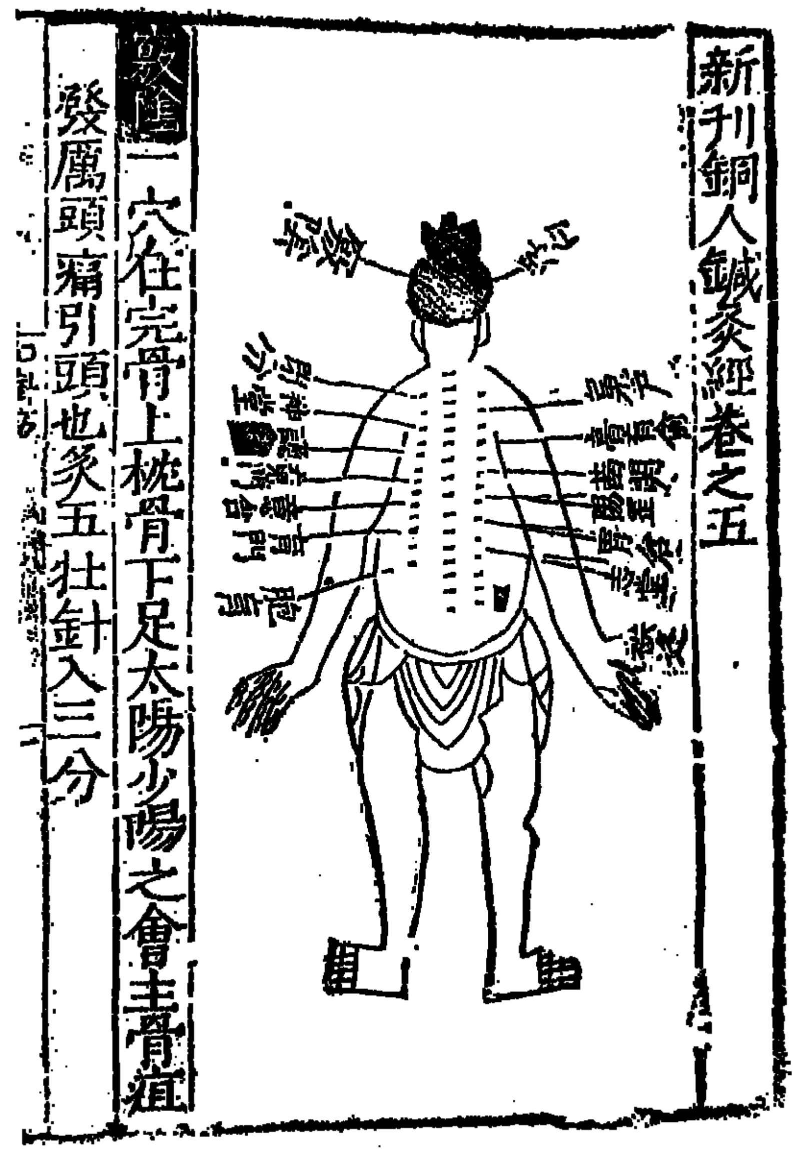
We showed some of these remarks to *C. P. Snow*, himself just back from the University of Texas, where there has been a high-level conference on Particle Physics (a subject touched on on page 498). He told us that

> The conversation turned to your kind of problem, and the interesting thing was that I heard almost precisely the same comment that you have had from Peierls and Good. That is, that the old academic resistance to popular exposition is now not only outdated but anti-intellectual: and it is the duty of any decent scientist to take an interest, and if possible to play a part, in serious popular exposition. Since Peierls and Good are both theoretical physicists, it begins to sound as though this is the present climate of the subject.
>
> It would clearly be absurd for the *TLS* to review the detailed day-to-day publications of scientific work, and I agree with Zienau that you ought to avoid didactic books. But you can do several things. Reviews of serious works of exposition, also works of biography and history—there will be an increasing stream of these. And certainly longish articles from time to time on selected broad fields, such as your recent admirable front-page article on Methodology. The account of the computer conference is a good example. The introd the computer is, of course, and no less threatening than introduction of moveable-type ing. Just as any intelligent century man ought to have had conception of what printing bring to intellectual life, so the tieth-century man ought to hav same feeling about computers.

It will no doubt be felt trying to do this at this par moment we are flying in the fa Dr. Leavis's recent critical about our article on the com and the general abdication of brows to "the climate of the nological age". Quite apart the fact that science—which all, knowledge—and technolog two very different things, we if Dr. Leavis himself would take this view, since it is the of his argument that the attitude and the sense of responsibility should inform those aspects of our age th finds uncongenial. The article the present issue, with their tion that many of our best minds are deeply involved in supposedly humanist preserv art, philosophy, perception, and language—and conversely some historians feel the need involved in science—do, we show that cross-fertilization be specialists not only is possib may be productive on both sid well as giving the outsider new ideas to think about.

As for the computer, which sense lies at the root of the launched in the two pr issues, we cannot share Dr. Leavis's nervously anthropomorphic tude towards that arrangement wires and plugs and switches. If computer writes a poem it is because somebody has made it so, in accordance with rules down by some would-be poet, the sole difference between its tion and that of a typewriter composing machine (whose the poetic process nobody now dream of questioning) is can introduce planned or variations within those rules, the accidental elements in po which have been so emphasi the past twenty years, the va may or may not be happy a human being of some kind got to be in charge, and the thing that matters is that he not be the narrow and technologist of popular m but should be fully aware work's wider implications socially aware if his machine dealing with (say) welfare statistics, and creatively (or cally) conscious if they touch arts.

In our view this confro with the computer is one most important problems facing us. And many others same. The most appa humanist would have been by some of the attitudes at the conference referred C. P. Snow, which was held in bridge on "The Use of the puter in Literary Research" reported here on April 2; for was a wide awareness of machine's crudities and the keep them under control. Li the typographers and librarians have thought most about have come, in this country to comparable conclusions. We aim, therefore, to print a series of special articles that reconsider the issues which with years ago under the heading of "Freeing the For this is the machine's point: it can do the donkey-work the mind free to think, and create. It will not do so, ever, unless specialists in other learn how to use it, and treating it not as a bogy but interesting, intricate, and ingly expensive—slave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Acupuncture points on the back, from Wang Wei-I's Manual, + 1026, reproduced (like the illustrations overleaf) in Clerks and Craftsmen.

East and West in science

JOSEPH NEEDHAM:
The Grand Titration
352pp. Allen and Unwin. £3 3s.
Clerks and Craftsmen in China and the West
470pp. Cambridge University Press. £7 10s.

T IS ODD to realize that we ave one of the great historians g among us. Joseph Needis not the only contemry to write an encyclopedic y, nor indeed the only one to up an entirely new field of ical research nearly singled. The special quality of his derives from something ional to the scale and scholarof *Science and Civilisation in* . This massive work is ind by an issue no less than that nature of *our* civilization. For m's China is a mirror to our- In the question of why ern science" failed to develop we may find some clue to the of how it was born, and then ed, in Europe. And by seeing e in this perspective, we shall se ourselves. For there was thing peculiar to Europe that ed this particular conception ural knowledge to take root flourish: and again it is in pe that its consequences, in all from technology to ideology, penetrated most deeply.

f course, it can be and has been of every other advanced civion, why modern science failed elop there. What makes China e as a comparative case-study t there are no plausible quick s, right or wrong. As Needhas shown, almost every obs prerequisite was there: a y stable yet not stagnant, with alth of sophisticated technol-, with widespread literacy, with cient respect for technical pros to create a consistent technivocabulary for printed descrip-, and with a world-view rooted the experience rather than in al insights. Yet something did happen here, didn't happen ; and the question is, what and ?

dham's work is a contribution e long tradition of European philia, perhaps one of the few ectuals' fancies that has been y beneficial in its effects. Like any before him, he has been ved by this other civilization, r enough to our own to be achable, and yet so different o be fascinating. For centuries, ever conditions permitted, travfrom our raw peninsula at end of the Eurasian continent gone to explore and admire great empire at the other end, ave returned to reflect. While its good and bad times, and ever been a Utopia, China has sed qualities which the cultitraveller has often found lack- Europe (to say nothing of its colonies): it is harmonious, ane. Indeed, one can read Needham's lines a sense of ation at the unfairness of his- if any civilization deserved the ge of modern science, and capable of putting them to the e, it was the Chinese rather ourselves. Yet it was not to be. haps the Chinese failure was ccident of chronology. Just Renaissance Europe was at ight of its ruthless expansion, realms of the mind as well as of territory, China was, scientifically at least, in a torpor. The hosts of the Jesuit scholar-missionaries were not overawed by their technical accomplishments; they were not in a position to put their guests in their true place as borrowers and parvenus. But the Jesuit scientists and their successors did bring something that China had never achieved, and could not be said to have been on the point of achieving. So, perhaps, after all, this civilization lacked some essential quality that was necessary for the fostering of the dynamic and revolutionary force of modern science.

That we can put the problem in this way at all is testimony of our debt to Joseph Needham. As his earlier essays show, when he started his work the task was to convince people that China had produced any science worth studying at all. Many parts of the scientific and technological heritage were well on the way to being forgotten in China by the time the Jesuits arrived; and in later centuries it nearly passed into oblivion for literary scholars. That the Chinese were hardworking, practical, even ingenious, was freely granted in the West; but apart from not having known what to do with gunpowder, the Chinese were credited with very little.

Starting from this almost blank historical record, Needham, together with his dedicated collaborators, created his magnificent encyclopedia. The talents required for this monumental work were such as are rarely found in one individual. When he became interested in China, Needham was more than a distinguished biologist; he was also a philosopher and a man of wide historical learning. Elsewhere he tells of how he taught himself Chinese as a hobby (working out his own system, of course), and during the Second World War he had some precious years in China itself, where his second life's work took shape. More than a quarter of a century of intense labour has gone into the work; and it is now difficult for a younger person to conceive the ignorance which had previously prevailed.

The volumes of *Science and Civilisation in China*, and some of the essays in *Clerks and Craftsmen*, are a mass of detail, consummately organized and displayed. Each such detail was a historical problem in itself. A set of printed characters might elude the translator; possible meanings would be divined, from context and analogy; illustrations might help, but corruptions of texts had to be reckoned with. The interpretation would then need to be tested rigorously against known parallels in the literature of East, Middle East, and West, and then explained in terms of the relevant modern theory. For this research, the Needham group had to achieve mastery of the results of science, and (more difficult) the workings of techniques, over the whole range of civilizations before modern times.

Again and again, Chinese priorities in invention would be discovered: and going through a list of these in isolation can give a casual reader an impression of a slight "prioritis". But if Needham's vision were so narrow, he would not have conceived and executed the encyclopedia. It is not this or that priority which is crucial to the case; but the chronology and path of transmission gives us evidence on contacts between the great civilizations. The "three inventions" that Francis Bacon extracted from the literature of popular science as providing the keys to the transformation of Europe were all Chinese: printing, gunpowder, and the compass. The mass of indisputable priorities proves the vigour of Chinese science and technology over two millennia.

As he has written, Needham has reflected; and although some of his informal lectures have doubled as galley-checking sessions, on occasion he has offered some particularly significant new work, or a new insight on the great problem, to his audience. These occasional pieces have now been collected and published: *The Grand Titration*—together with the earlier *Within the Four Seas*—provides a record of his historical and social reflections over the years; while *Clerks and Craftsmen in China and the West*—sumptuously produced, uniform with the encyclopedia—contains some more technical essays as well, and is generally of a more recent vintage.

Certain themes recur through the years in which the essays were composed; and these provide reference points for each inquiry. China itself is a landlocked empire, incurious about its neighbours; its topography and hydrography present conditions for an "hydraulic civilization" under central control; the dominant social form through history was a "bureaucratic feudalism", with a non-hereditary civil service; and "merchants" were a distrusted class. The basic metaphysics were ones of harmony rather than domination, and the differences between Taoists and Confucians were not over the principle but over its prime area of application—the natural or the social world. And natural knowledge and techniques were respected; legendary inventors were revered; great engineers could rise from humble origins to eminence; medicine was a learned profession which maintained its roots in practice.

China early enjoyed the full range of natural-philosophical speculation, systematic natural history, and sophisticated physical and biological technology, at least equal to the corresponding fields in Europe of roughly the seventeenth and eighteenth centuries. Needham estimates that China's lead in medicine lasted until the late nineteenth century. But there were the fatal exceptions of the deductive mathematics and the associated mathematical sciences carrying our "scientific revolution", which were available in the West from classical times but which were totally absent in China.

China's failure may be more easily seen when we appreciate that what happened in early modern Europe was not one event but two, close in time but different in character. During the sixteenth century, amid the shattering wars of religion, confusion, and near-chaos in the established institutions of learning, with the Turk ever pressing at the gates, there was yet a transformation of the "operative" arts; restoration of ancient knowledge; revival, improvement and diffusion of techniques; and revaluation of

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Robert M. Young

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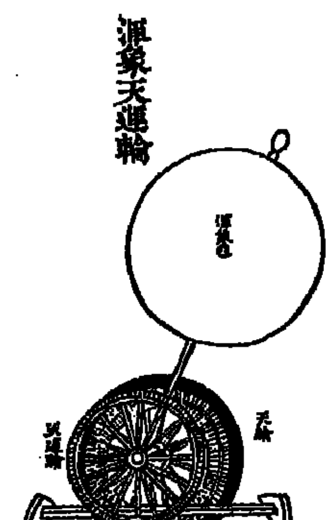
Oxford University Press

them by the educated classes. The record of this transformation is in the printed literature of that century; at the beginning, a few small books purveyed rudimentary techniques, and by the end many fields had risen to full sophistication in their methods and achieved wide diffusion in books and teaching. Without getting into chicken-egg problems of causation, we can say that this development was associated with commerce, manufacturing and conquest, in the framework of "early capitalism". Whether we should call this "science" is a matter for fruitless debate: Dee and Paracelsus were as "typical" of their age as Tartaglia and Agricola.

The mathematical arts provide a direct link to Descartes and Galileo, and their revolution in the philosophy of nature. Descartes learned them at la Flèche, and Galileo taught them to his well-born pupils at Padua. Even if the "scholar" retained his traditional contempt for manual operation, the "gentleman" of that time was not so fastidious; war and commerce demanded competence in at least certain arts that did not smell too much. And as is well known, Greek geometry (absent in China) provided both the method and the guarantee for the achievement of Truth in their new world of nature, consisting of dead matter stripped of its numinous and human qualities. This was the decisive second stage in the origins of modern European science; and it was by no means forced by the internal development of techniques and knowledge. For Gilbert, Kepler and Harvey, each in his own way, operated in a world infused by intelligent spirit. There is of course much more to the story than this. The social style of inquiry into nature had to be changed from that of the craftsman with his profitable secrets to that of the scholar gaining rewards by publication; and as we see from the case of Harriott in England, this did not come all at once. Also, such a deep change in the underlying metaphysics of nature could not, and did not, occur with sudden finality; the nineteenth-century debates over vitalism and evolution showed that the mechanical approach had a long and winding path to victory.



Clockwork axis drive in Su Sung's Globe Tower, begun in + 1088.

In this way, modern European science began its triumphant ascent. Looking back, we can see its success in terms of a severely restricted programme executed in a series of favourable environments. Searching for abstract laws rather than subtle harmonies was the effective procedure for establishing the foundation-sciences of mechanics and of the gross properties of inanimate matter (what we now call physics). This reduced conception of reality, together with a fruitful interplay of scholarship, medicine and commercial exploitation, enabled the later conquest of chemistry. On its basis, the penetration into the reality of living matter could be achieved, with Joseph Needham himself playing an important and honoured part in this last campaign.

Although this sketch of an explanation of China's failure and Europe's success will not be found in so many words in these essays, it could not have been formulated without the initial stimulus provided by Joseph Needham, continuously supplemented by his work over the years. And for Needham, even the explanation at this level is not complete; for we know from the Chinese that as civilized men we are obliged to render due respect and reverence to our ancestors, material and spiritual, for their achievements and for our inheritance from them.

On this deeper issue, of our relation to China and our debts to her, Needham has reflected repeatedly. Even to establish a case, he first had to argue against the consensus of historians of science, amateur and professional, that the only significant science is that related (in its results or in its methods) to the single strand running from Galileo to Einstein. Needham's enlarged view of science is necessarily an ecumenical one; one must recognize and honour not only botanists and ethnographers, but also those anonymous craftsmen who created such workaday items as the harness and the wheelbarrow. Such a broad conception is difficult for anyone who lacks Needham's memory and talent for assimilation: and if it is not to be an amorphous veneration for everything that ever happened, such a history must be informed by a final cause appropriate to it.

In a recent essay reprinted in *Clerks and Craftsmen*, Needham has identified one possible candidate for the final cause of the history of world science: the "ecumenical science" of the international fraternity of scholars devoted to the study of the natural world in the past few centuries. The earlier endeavours of all civilizations can now be seen as "Rivers going to pay court to the Sea". With this framework, Needham can study the relations of Chinese and Western science, using the ideas of "transcurrence" and "fusion". The former is the point where the old is overtaken by the new; the latter is self-explanatory.

Or is it? Certainly, there has been a fusion of the community of scholars, as Chinese, Egyptian and English scientists all cooperate in scientific inquiry in a single uniform style. But to consider this as a fusion of *sciences* is to be kind to China, to a misleading degree. For (outside medicine) the process has been the summary displacement of indigenous conceptions, and the loss or drastic reinterpretation of indigenous techniques, consequent on the invasion of an alien system of

Ephedra sinica (*whence 'ephedrine'*) *from the Ta-Kuan pharmacopeia*,

knowledge and procedure. Thus the idea of "fusion" does not protect China from the indignity of having been one of the tributaries to a sea which is ours; for "ecumenical science" is the science descended in spirit and method from Galileo's abstract mechanics and the crude aggressive environment of early modern Europe.

Moreover, the idea of modern European science being the "sea" implies that with this science we have reached evolution's end. It might appear surprising that Needham, familiar with the lengthy cycles of growth and decline in every civilization, should assume that a few centuries of development in the particularly unstable context of European civilization have brought science to perfection. But then before he was a sinologist Needham was a biochemist; and the dazzling conquests of this science, in new knowledge and retrospective explanation of the successes of old techniques, make it difficult to imagine how it could be modified for the better. The international community of scholars works in a style that is harmonious and urbane, and so seems to be the best realization of the most admirable qualities of China which European civiliza attain.

Yet the contradiction betw European science and Chinese ci zation is not completely resolv this way. For, in the laborator style is Galilean: to create an a cial, unnaturally stable and environment, from whose simple laws can be derived. A the dominant traditions of pean science, the laboratory is merely one approach among it is a way of life. Needham observed that Chinese medicine so far resisted "fusion": thus puncture is still practised fully and on a large scale, and so far kept its secrets from ing neurophysiologists. M furnished us with another cant example, related to When Dr. Norman Bethune covered that the bacillus is "cause" of tuberculosis poverty, he found himself at with the "ecumenical" scien medicine, and so started the age for humanity that ended medical hero's death with the Route Army in Yenan.

Indeed, as we pass farther scale of organization away Galilean point-masses, the cies of the Galilean style more pronounced. We need so far as to compare the Chinese landscape based on the pseudo-science mancy, with *La ville* Corbusier's stark Cartesian The concept of "environ which did have an honoured in Western medicine it was replaced by germ an eminently Chinese one. great deficiency of the new phers of ecology is that they ally seem to know so Tao. Needham has materials for this new science, one which could be ecumenical; and yet so far not drawn the conclusion. would involve a deep that science to which he made important contributions, which so much of his life affections are involved. But great scholar, he is young, and we can look more years of being charmed, lighted and educated at his feet.

To the Editor

'Literarism' versus 'Scientism'

Sir,—One thing, at any rate, emerges from Lord Annan's reply (April 30) to my lecture: he desires—intensely desires—to have it understood that the letter he wrote to *The Times* proposing that the universities should "lay on" vacation courses for the cramming of what are now called teenagers did *not* deserve the commentary I made on it in my answering letter to *The Times*. He believes (unlike me), he *says*, in "pluralism and compassion": that proposal, we are to understand, was a fling of compassion—something not to be taken as a characteristic expression of his habitual attitude towards, and conception of, the university.

The other thing that might be said to emerge clearly is the insistent explicitness with which he declares his devotion to the intellect. "Universities"—this is the clinching proposition he offers us—"should hold up for admiration the intellectual life." I myself think this, offered as the essential emphasis, hardly a felicity. But the point to be made regards the self-contradiction in which Lord Annan is inescapably involved—a self-contradiction that would itself have been enough to explain why it should be so impossible to find any coherent argument in his set-piece.

He brings in the theme of reforms decreed for enforcement in the sixth form curriculum, implying that they have been at issue between us, and that they may now be relevantly made a matter for a significant challenge to me—a challenge to say clearly at last where I stand in regard to them. But actually the only way in which they had come up had been that, in his now notorious letter to *The Times*, he adduced them as among the menacing prospects that should make the dons in their citadels of privilege think twice before doing anything but yield to the pressures of advancing democracy: cramming those unenthusiastic children for their "qualifying" exams would, he said, be good practice for the unaccustomed kind of work they would *have* to do when the reformed sixth form curriculum came into force. My only comment regarded not the postulated imminent reforms but Lord Annan's attitude and its significance, which was to the effect that dons must learn to forget their privileged fussiness about the intellectual standards proper to a university: they must serve society.

He is profoundly aware of criticism to which he is exposed. His uneasiness comes out in his tactics. Thus he hopes to pose me with the question whether I think it a pity York University was founded. The truly relevant reply is that in English, in which York is in a position to be very selective—and in regard to which I can testify, out of some intimate acquaintance, the standard of students is high, and work at university level is possible, to the pleasure and profit of students and teachers and the advantage of the university. This is all I will, or need, say about York in reply to Lord Annan's tactical use of my known connexion. But I will add that I have talked with many university teachers from many universities and I have seldom talked with one who did not comment on the problems and disabilities caused by the depressingly large presence at the university of students who were not university material.

For the advocates of the comprehensive university, of course, the last phrase is meaningless. Lord Annan, to judge by his article, would prefer to be thought of as taking a decidedly different line. I shall [illegible] impressed by that [illegible] Lord Annan, publicly [illegible] repudiates the conception of enlightenment, democracy and progress voiced by Mr. Fowler, Minister of State, and Mr. Christopher Price, M.P. The last-named says in his letter to the *TLS* (April 30) that he "simply knows that the demand for all forms of higher education . . . is growing apace", and he merely "wants to plan for this inevitable demand". I still think that he is, as I said, "innocent", in that he, at any rate, is not consciously disingenuous. The direction in which his idea of the "inevitable demand" drives may be seen in his article on enlightened Sweden ("Sweden's New Comprehensiveness") in last week's *New Statesman*. The late Kingsley Martin, it will be recalled, writing, towards the end of his life, on Sweden as the ideal civilized society, observed in a puzzled way that the Swedes, very curiously, didn't seem to be happy.

Lord Annan himself thinks it safe to dismiss my use of the word "creative" with easy mockery, and to be, in a light intellectual way, merely amused by the phrase "collaborative creative effort". And the letters you, sir, have selected to print will assure him that he has the kind of support he needs. "There never was a golden age of an 'organic' community"—the misrepresentation that dismisses my concern and my argument in that way is not his invention: it is a routine among the enlightened. As Lord Annan invokes it, it is his dismissive reply (he offers nothing more like a reply) to my observation that "organic" is a necessary word, for which the technological age proposes to have no use.

There is, then, little reason why he should find himself disputing the claim that a computer can write a poem. It is, in culturally influential circles, coming to be accepted as a valid one. Thus in Friday's *Times* Mr. Peter Jay, Economics Editor, expressing poised surprise at my challenge, informs his public that, having re-read and reconsidered my lecture, he still "sees no insuperable conceptual difficulty about a computer writing a poem". Lord Annan himself, I am pretty sure, in the cultural milieu from which he takes his colour, could [illegible] the same position. In fact, I suspect that letters will have been received in the *TLS* office to the effect that the questioning of the claim is ignorant, prejudiced, out-of-date and indefensible.

F. R. LEAVIS.

12 Bulstrode Gardens, Cambridge.

Sir,—I was the "lady philosopher" who so shocked Dr. Leavis by saying that there might be computer poetry. Dr. Leavis says (April 23) that this depends on what is meant by poetry, and, as Peter Jay remarked in *The Times* of May 2, poetry may be so defined that it becomes trivially true, because self-contradictory, to say that it could be produced on a computer. What is a discussible question is whether computer verse (to put it no higher for the time being) and poet's poetry, both of which undoubtedly exist, can bear any significant relation to each other.

Animosity against "computer poetry" is often based on the notion that it must be mechanical, stereotyped, inhuman. In fact, as with all operations with computers, an inventive human mind has to interact with the machine. In a computer poem, there is a *frame*, or pattern, which is built into the machine, and *thesaurus* lists from which words are selected according to an ordering guide, which works on a *semantic schema*, the selection being made either by your choice as operator, or initially by the machine, which will throw up a large number of possibilities from which you can then choose. This can set you thinking about a poem as something which has a pattern, and also about strings of words linked by devices such as rhythm and assonance. Instead of associations by social and psychological stereotypes, you have a help in loosening up, and you can play with a great variety of associations most of which you reject, but some of which may fire your imagination. Margaret Masterman and Alan Twist, both of whom have written computer poems, have compared their frames to "toys". This will no doubt outrage Dr. Leavis, who was obviously outraged by my remark about these operations being "fun". But fun, like children's can be a preparation for som deeper.

Whether Dr. Leavis, or indeed of us, likes it or not, more and people are going to be working computers, in laboratories, in in offices. If they get excited ing about possible patterns words can be cast and by play strings of words, this might not large their vocabularies and words, but produce a new kind art. I should certainly not say results could take the place of ten poem which succeeds in tive expression to a personal But they might help to produce culture in which people went these games to find that personal poetry came alive for them, and them might try to write it. This puter would be a tool for an which needed both a love of a scientific skill, and encourag Do we not need to look for points like this between literacy, rather than conce picture of a beleaguered culture grimly defended battled Dr. Leavis and his

DOROTH

11 Millington Road, C

Sir,—Lord Annan's 30) to the earlier terms a long-standing differ Leavis tends to obscure at issue today. In spite of of challenging question the apparent omission of obscure the import of questions; he leaves out can be put just as chall realistically on Dr. Leavis

Most dons have little —and more is the whether the primary aim for hundreds of years hold up for admiration life" or to encourage goodness. Convinced versities have done and of worthwhile things and more difficult to in what they judge to

The questions be bins Report, and

of Lord Annan's persuasion are (1) Does the expansion of the ersities, apart from the expansion her education of other kinds, cor nd closely to the increase in the ber of people naturally equipped adequately prepared to profit from various university disciplines, or it allow for standards of admis to be relaxed? Statisticians and icians tell one story; practising another. (2) Even supposing that sion does not mean relaxed ad standards, can the universities at the proposed rate without ging their nature? Lord Annan forgive me if, weighing my words, that any honest don must answer that the decision-makers would ter to attempt to weigh, honestly, gain against the loss rather than to d, in the face of all reason, that will be no loss.

One does not have to do much reading between the lines of the Robbins ort and later papers on policy to see one of the intentions of this policy to have the universities accept and some extent make good the deficien of the neglected and overstrained of secondary education, and that situation is expected to get worse. ever their philosophy of education, are unlikely to confuse propa da and rhetoric with intellectual ment or to identify political expe y or panic reactions with the pur of goodness. They find themselves paid and are told that they must much harder, that they must teach learning or thinking and—from to time—that they must not refuse ach the labels of academic success to those who have proved them idle or unteachable. There is a piracy to hide the realities of a which, if it is resolved by policies current, can only diminish intel and many kinds of goodness.

The universities are not to blame for increasing proportion of mixed up incompletely responsible young le who come to them to sort them and be sorted out, to make some ess in clearing their minds, organ their emotions and founding their values. But if the universities are d into cramming establishments— particularly if the cramming is or mainly in science and tech —confusion and irresponsibility increase.

Lord Annan assures us that this is what he wants; but I would claim to most of us within the profes some move in this direction seems evitable result of the policy he ours. Of course demography has a ing on social need; but it does not, itself, determine it. Secondary and er education is, alas, not an "eleg but dwarf plant" waiting for the ost of our good will; the truth is it is pot-bound and struggling, and to bear some shrivelled fruits.

J. M. COOKING.

2 Clorane Gardens, London, N.W.3.

—Many people must now have ed your issue of January 1 this They may have noted that the review which inflamed Dr. Leavis prominent and approving notice to book *Computers, Managers and* ety; indeed, it goes so far as to be it as "knowledgeable, intelli and clearly written". While my are not identical with those of reviewer, many of these people, his excitable approval, and too a glance through the book, may e to.

the notice first appeared, I was pleased the book had found sufficiently interesting for front-page treatment, I immediately felt that your reviewer had detected in it exactly what he wished to find, i.e., reinforcement for an essentially narrow technocratic vision. I was sufficiently cross to prepare a letter to you then, dissociating myself from many of his statements and speculations. On reflection, however, I doubted whether the points I raised would be sufficiently interesting to your readers; and it did seem rather churlish to repudiate opinions which, with luck, might be ascribed to me only rarely, by the uninformed, and by association, which had appeared in a notice which was so outgoing to me.

Dr. Leavis's publicist flair now makes it important for me openly to disclaim general adherence to the social philosophy of thinkers such as I take your reviewer to represent. And there are three points where our views diverge so widely that I shall take this opportunity to stress them.

First, your reviewer resorts to a "total systems" conception of society. He writes: "We have come to see that man, computer and environment are elements in a total system which we can understand and control with the help of 'cybernetics'." *Understand*, when man becomes only an "element"? *Control*? Perhaps, if "we" (and who exactly are "we"?) do insist on viewing man not as prior but as just another element, another variable, another resource. Such an approach is, to say no more, methodologically restrictive. The "systems" notion may have value as a sensitizing concept, or even as a kind of literary device, but as manifestly understood by your reviewer—and this is highly symptomatic of the social analysis of technological utopians—it leads to such statements as: "Similarly a well integrated individual reacts to a social atmosphere on the closed loop principle; he behaves in a certain manner, senses the response of people around him, and adjusts his behaviour accordingly so as to create the impression desired."

He becomes, in other words, a Pavlovian dog who has mastered the additional tricks of "impression management". Now we all know people who are reminiscent of this model social actor, but would we regard them as either "well adjusted" or exemplary?

This approach readily leads, as I point out in *Computers, Managers and Society* (p.194), to a new metaphysic, to a reification and idolatry of the (generally beneficent) "system". "Society is a self-adjusting mechanism", we learn. This will be a comfort to many: for instance, to the Czechs, to the poor of the Third World, and to American negroes. Concorde sometimes thunders over my office, Porton Down is handy, I have just read *Warwick University Ltd.*: but perhaps all these unpleasant things are just healthy signs of society adjusting itself. Or are they? For your reviewer remarks that the system of society can have *wishes* that in moments of perversity it even "wishes to commit suicide".

Second, it is surprising to find your reviewer conjuring up the "terrifying prospect" of massive idleness following the "computerization" of work if he truly believes society to be a self-adjusting mechanism. Personally, I do not think we shall have to face such a prospect for a very long time to come, and if and when we have to it will only be terrifying if one believes, apparently as does the rather puritanical technological utopian, that Satan must find work for idle hands to do.

The third specific opinion of your reviewer that I repudiate is that my book is "intelligent". "Intelligent" here equals "agrees with me". At the very least I am reluctant to agree with anyone who dares to expound the challenging "systems" metaphysic so glibly. So please may we have it plain: whatever its other faults, *Computers, Managers and Society* is not "intelligent".

A word about Dr. Leavis: Much of his analysis, though sociologically unpretentious, may be right. But why does he have to be so right, so often, so loud? It becomes counter-productive, and his corrective prescriptions are too fatherly and nostalgic. And incidentally, on my reading of such poems as "Nottingham's New University", an English faculty, or any other sort of faculty, would be the last place D. H. Lawrence would have sent the young for the succour of their intuitive gifts (or to "think with their blood" as he has it).

Finally, may I have my little say on the "two cultures" issue (or is it "three"? C. P. Snow graciously admitted the social studies as a further intellectual tradition when he took his "second look")? Surely a "culture" which to some extent does unify particular perspectives and traditions derives from philosophy, through its ability to explicate each one and relate it to others. I claim this reluctantly, because in doing so I have to admit in my own views and values a persistent and imperialistic "sociologism". Philosophy is an excellent antidote to this narrowness, and I see no reason why it should not prove equally good medicine for the respective narrowness of "scientism", "literarism" and—this is by no means contradictory—"pluralism".

MICHAEL ROSE.

Lecturer in Industrial Sociology, School of Humanities and Social Sciences, Bath University.

Sir,—Dr. Leavis is, Lord Annan admits (April 30), "armed against lightweight attacks" of which Geoffrey Grigson's letter might be taken as a fair sample. But Lord Annan doesn't seem aware of the inadequate calibre of his own ammunition.

His attitude to Dr. Leavis veers unhappily throughout the article from animosity to deference and back as if he were unsure whether to prowl round his adversary, clawing occasionally, or to go in for the kill.

Lord Annan claims to have been misrepresented by Dr. Leavis in the past; and appears to be not above tactical misrepresentation himself. At one point, for example, he wishes to demonstrate that Dr. Leavis made a complete volte-face on *Lady Chatterley's Lover* between the time of *D. H. Lawrence Novelist* and the *L.C.L.* prosecution six years later.

"It violates Lawrence's own essential canons as an artist", Annan quotes Dr. Leavis as saying then. But Dr. Leavis said almost exactly that in the passage Lord Annan quotes from the earlier book: "It offends, surely, against [Lawrence's own canons—]the spirit of his creativity. . . ." The brackets mark Annan's editing. Again, says Annan, by the time of the trial Leavis found Lawrence's rendering of sexual experience in the book "strongly distasteful". Again, it's all in the earlier book, immediately preceding the passage Annan quotes: "The willed insistence on words and facts must . . . have something unacceptable, something offensive about it."

So by editing, Lord Annan creates the illusion of a volte-face out of what was no more than an increased emphasis.

On the purpose of the university, for all his talk of evidence and actuality, Lord Annan is ambivalent: "What matters most at a university is the meeting of minds." Well, Dr. Leavis would not disagree with that. But "meeting" is the key word, and at some universities minds signally do not.

Everything is "secondary to the cultivation, training and exercise of the intellect".

What does this amount to? "Cultivation" smacks of dilettantism, while "training and exercise" evoke a strange picture of a cerebral gymnasium where athletes limber up for a race they are never to run: weight-training with chess and crossword puzzles.

"Universities should hold up for admiration the intellectual life." Again, it is like a mental Olympic Games! And how can "the intellectual life" be severed from any other kind?

As for the image of "scholars who have put on one side the world of material success . . . in order to study with single-minded devotion some topic because that seems important to them"—as well hold out this picture of the university for people to admire as have a piece of cheese crawling with industrious maggots under their nose. This is not a meeting of minds but a fragmentation and divergence, a blind burrowing. Of course research-work can be important and vital, but Lord Annan does not present it that way.

"To produce out of the chaos of human experience some grain of order won by the intellect." In this context, "knowledge" would seem more accurate than "experience". There is a world of difference between a whole mind coming to grips with, organizing and possessing its experience, and an intellect engaged in working out puzzles, absorbed in its own minutiae.

Lord Annan's own language does not reassure one much: "The elegant but dwarf plant of secondary education"—what does that astonishing "elegant" mean here? It speaks of an attitude to secondary education which falls somewhere short of committed, and together with the earlier "cultivation" is distinctly ominous.

One's faith in Lord Annan's criteria is not increased by his invocation of Keynes. When, on the other hand, he adduces E. M. Forster, he appears unwittingly to be endorsing Leavis's position: "Forster taught me to be sceptical about schemes for human improvement."

That surely is what "Literarism and Scientism: the misconception and the menace" was—among other things about.

STEPHEN THORN.

King's College, Cambridge.

Sir,—The controversy involving Leavis, Snow, Huxley and others has been a war too much of words and too little of concrete issues. He now, in the lecture printed in the *TLS* for April 23, charges the "educated and cultivated" with having lost any sense of ends, any wise notion of goals for the science, the technology, and the politics. This argument—taken along with many others of Leavis's from *Culture and Environment* (1933) onwards—implies that once we did have such a sense and such a wisdom. Indeed we did, and they were religious. People believed in salvation, redemption, the after-life, and that whole family of notions that most people in our culture—whether "cultivated" or not—can no longer take seriously, for they have turned out to rest on illusions as to what life in the universe is in fact like. Leavis has therefore little to say when he has to give his view of what life is for—at best only the embarrassing vagueness of that sentence in *Two Cultures?* (1962, p. 26) about "that to which, opening as it does into the unknown and itself unmeasurable, we know we belong".

In fact Leavis has said much more specific things in many conversations that I have taken part in, and though to adduce these may seem an illicit method of debate, anything more general would evaporate into mere verbiage. First, Leavis once said witheringly that the parent of one of his friends was "being kept alive by science". I am not unaware of the dilemmas now arising from the new kinds of intensive care. But this is the margin of medical science, not its centre. For my own part I am unendingly grateful that my father has been kept alive and vigorous by a drug that controls high blood-pressure and that my wife was enabled to come safely through a difficult confinement. Secondly, Leavis once recalled, as a typical item from the good old days of unadulterated food, that in his childhood you could buy butter in Cambridge market wrapped in a cabbage-leaf. For my own part I am glad to have exchanged such idyllic items for the vastly improved life of the people who make the butter. In Leavis's childhood one-third of all country people were earning too little to maintain minimum physical efficiency. As they said themselves, "cabbage killed many a babby, but kept the next biggest alive". (*Joseph Ashby of Tysoe*, 1961, p. 36). Finally, when I taxed Leavis with commending Lawrence while denigrating that new freedom from the sexual guilt, shame, and inhibition which Lawrence had struggled against, Leavis replied that really the young people were not happier or more fulfilled, for all their greater liberty. *How does he know?*

Cultures just cannot be compared overall. Modern man has reduced the back-breaking toil but increased the boredom of the conveyor-belt. He has minimized the epidemics but maximized the armaments. He has reduced the fear and grief of constant infant deaths but lost the sustaining illusion of a sanctioned goal beyond this world. Therefore it is irresponsible for Leavis—as it was for T. S. Eliot—to encourage people to think of the modern dilemmas as unprecedentedly cruel. Leavis's accuracy of mind enables him to formulate many of these dilemmas with a fine force and precision; but his emotional conservatism makes him cloud the issue with an unreasoned down on modern life.

DAVID CRAIG.

107 Bowerham Road, Lancaster.

Sir,—May I please be allowed to take up a side-issue arising from the Leavis-Annan discussion—namely, Mr. Geoffrey Grigson's 'snide parenthesis' that "we leave Dr. for those who cure our ailments"?

The fact that, whereas a couple of decades ago one might rightly have been considered "pushing" to insist on academic titles, the situation has now so changed that it has become both necessary and prudent to display them. This does not relate to any increase or decrease in the number of doctorates being awarded so much as the growing tendency, at least in provincial universities, to appoint to positions of seniority men who have neither research nor publications to their credit. In my own university, professorships have recently been given to men whose qualifications do not extend beyond the bachelor's degree (in one case a fourth!) and who have no public reputation to offset their mediocrity. Indeed, the university has at times made no secret of its belief that industrial or practical experience constitutes the best possible criterion for an academic post.

Equally pernicious is the tendency, at present more apparent than ever, for "assumption" to take the place of "achievement". Lately, I was told by one of my staff: "But I expect my colleagues to have a Ph.D., don't you?" This was from a man who had not yet (or since) attempted his master's degree. Of course, it may well be that Oxbridge scholars actually do take these things in their stride though I scarcely think I am the first to have observed port-swilling mediocrities dilating on the monograph they will never write. But lesser mortals are often in the position that unless they assert their qualifications, they are apt to get overlooked. In any case, Dr. Leavis is a special case. I should have thought his title carried overtones similar to those borne by Dr. Arnold's and should accordingly be retained as a mark of respect.

Should this last sentence arouse the opposition, may I further point out that Dr. Leavis holds a Ph.D. and D.Litt., whereas Mr. Grigson's privileged healers rarely aspire to more than an M.B. B.Ch.—another fact that is not without bearing on the question of "assumption" and "achievement".

LAURENCE DAVIES.

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Communication by means of language

DONALD M. MacKAY:
Information, Mechanism and Meaning
196pp. M.I.T. Press. £3 5s.

F. H. GEORGE:
Models of Thinking
166pp. Allen and Unwin. 35s.

PETER HERRIOT:
An Introduction to the Psychology of Language
197pp. Methuen. £2 2s.

EDMUND CARPENTER and MARSHALL McLUHAN (Editors):
Explorations in Communication
208pp. Cape. 30s.

In one guise or another, the question of how the study of communication and language can contribute to our understanding of human nature is one that constantly crops up in modern Western thought. In linguistics, in philosophy, and in psychology, the problem of human language and the human mind is one that recurs again and again. By studying some aspect of language or communication we may hope to gain some insight into the working of the human mind. But we can hardly do this directly: we have to proceed by formulating a model of some particular aspect of the human communicative faculty to account for one particular body of data. The first three books reviewed here are all to some extent concerned with such models—communication models, psychological models, linguistic models—and all have to face the ultimate question whether any such model is an end in itself or whether it parallels in some real sense the human activities or capacities it purports to describe.

Man's communication with others of his species differs from that of other living creatures in that man alone has the faculty of language. He is not restricted to a fixed repertoire of cries, as is a bird or a gibbon; nor is his message expressed as a simple physical analogue of the information being conveyed, as is the message of the bee using a dance to inform its fellows of the distance and direction of a honey source. Yet man's communication is similar to these other forms in some respects at least, for all succeed in the task of conveying "information" from the sending organism to the receiving organism. It is the analysis and quantification of processes of this kind which has occupied information theorists over the past twenty years.

Professor MacKay, of the Research Department of Communication at Keele, is among the founders of information theory and one of its leading exponents. In *Information, Mechanism and Meaning* he performs the courageous act of assembling a retrospective collection of papers first published between 1950 and 1964. He has added some introductory material and a linking commentary to describe the background to the various articles and to relate them to one another. We see the gradual development of the notions of information and information-content, with the revising and expanding of Shannon's seminal formulations; then follow attempts to apply the theory to subject-matter as diverse as optical instruments and atomic physics, telephone channels and neurology. Perhaps inevitably, the heterogeneity of this collection—some of the chapters were broadcast talks, some were technical papers in learned journals—leads to a disconcerting fluctuation of style. At some places Professor MacKay uses schoolboy-simple illustrations from everyday life, but at others he assumes that entropy, the construction of a vector-model in hyperspace, and the calculus of partial differential equations, are matters which the reader will understand without explanation.

Professor George's *Models of Thinking* is the first of a series entitled "Advances in Psychology". It consists of two parts with a summary. In the first part the author defines his terms, reviews various theories of learning and cognition, and lays down a background for his methods. He sees the human being as an organism using a memory store and sensory inputs as sources for the thinking activities of recognition, recall, concept-formation, hypothesization, and deductive reasoning. He notes that language "must play a vital part in the information processing". In Part Two he tries to model this thinking capacity in computer-programme form. This involves a good deal of symbolic logic in the modelling of the formation of concepts, inferences, and deduction. But behind the neat logic formulas and flow-diagrams, Professor George is aware—somewhat uneasily, it seems—that actual human beings are apt to disrupt all the smooth data-processing by emotions. As he puts it in a paragraph headed "Oddities of Thinking", "emotional features must ultimately be brought into a programme, either directly by chemical (or colloidal-chemical) means or indirectly by mathematical functions". "Psychological" in popular parlance is often a near-synonym of "irrational, illogical, emotional"; and until the computer-psychologists have managed to incorporate such characteristically human features into their model of thinking, their model will remain seriously inadequate. However much we may like to think we are rational and logical beings, the fact remains—as advertising men, politicians, and propagandists know—that we are not. One is thankful to note Professor George's modesty:

> Perhaps it should be said bluntly that any attempt to programme the full range of human behaviour is quite beyond us at the moment and in this book we are only scratching the surface of what we take to be the central problem of thinking.

Neither Professor MacKay nor Professor George takes into account the revolutionary ferment in linguistics whereby in the past decade Chomsky and his followers have upset many received ideas about language. The intellectual fashion in linguistics had been to concentrate on the empirical approach at the expense of the rational: to take nothing for granted, not even the existence of the mind, ideas, or emotions, and to formulate and test hypotheses only on the basis of externally observable data. So phoneticians analysed sound-types, classifying them taxonomically into phonemes, while grammarians analysed sequences of phonemes, classifying them into words and longer structures. The great aim was to account for a corpus of utterances in a language; when it was adequately described, the task was done. The emphasis on language as observable linguistic behaviour, in tune with the whole approach implicit in the use of the term "behavioural science" as a synonym for psychology, led to a welcome rigour in experiment and theorizing; but it diverted attention from the central problem of language and the mind on to the periphery of overt behaviour, and has been compared by Chomsky to the replacing of physics by a "science of meter-readings".

In *An Introduction to the Psychology of Language*, Dr. Herriot devotes separate chapters to the "generative" approach of Chomsky and his followers and to the "behaviourist" approach which Chom has so strongly attacked. He neither approach as entirely ade ate, and criticizes the adherents both for rationalizing and setting straw models of the opposing th in order to knock them down. Re cognizing the importance of th generative psycholinguists' discovery of "deep structure", but dissati with their separation of langu from other forms of human beha iour, he sees a way forward thro the "schema and strategy" theo propounded by Lunzer. He cl that this theory has the advant both of accounting for behaviour general and of representing the fu tioning of the central nerv system:

> The strategy corresponds to the st operation of the organism at any gi time; the schema to its potential regulated behaviour. The strategy m be likened to the "flow" of current any phase of the operation of th machine; the schema is the wir diagram itself.

By no means least among th virtues of Dr. Herriot's book is th mass of up-to-date bibliographic references.

From the profound to the fri *Explorations in Communication* is collection of articles reprinted fro the University of Toronto jour *Explorations*, published in the 195 and now out of print. It presents characteristic McLuhanesque mix ture: valuable nuggets of truth ov whelmed by a gaudy gallimaufry of candy-floss generalizations, spe cially sounding significant but di solving on closer examination into windy exaggerations or plausib falsehoods. The media is the mes sage, the mad ear was the mass age, the mode here is the mass sa Print has no place in our pos literate global vile age (even thou it is still only the despised literate who have ever heard of McLuhan).

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Finding the right terms

LANCELOT HOGBEN with MAUREEN CARTWRIGHT:
The Vocabulary of Science
184pp. Heinemann. £2 2s.

Professor Hogben here calls the linguistically slovenly Anglo-Saxon to order. The vocabulary of Western science, he argues, is undergoing a process of "semantic degradation" which is leading gradually to the betrayal of the high standards of rationality, precision, and intelligibility set by such philological heroes of the eighteenth century as Linnaeus, Guyton de Morveau, and Lavoisier. As a result of rapid advances in what we might call the natural history tradition in science (a tradition that embraced chemistry quite as easily as it embraced botany and zoology), these men were beset by an unprecedented number of vegetable and animal species and of chemical substances which had to be named and classified. Having at their disposal only a meagre scientific vocabulary, which surprisingly had been almost unaffected by the classical scholarship of the Renaissance, they turned to the dead languages of antiquity for their new words. Thus freed from any overtones of meaning carried over from the vernacular, the new terminology of Linnaeus's *Systema naturae* (1735) and of the *Méthode de nomenclature chimique* (1787) of Guyton, Lavoisier, Fourcroy, and Berthollet was easily endowed with unambiguousness and, for anyone who knew his Latin roots or more particularly those derived from Greek, an almost supranational character. [illegible] tedly, thanks presumably to the British classical tradition, the nineteenth century could still produce etymologically impeccable words like "cathode", "adiabatic", and "electron"; but it also reflected the contemporary fashion for scientific hagiography by giving us such inexpressive units as the "ampere", "joule", and "ohm". And worse was to come in our own century. Following the precedent of Pluto, we are now assailed by monstrosities like "laser" and "maser"; and, quite without precedent, we have that "nadir of verbal vulgarity", the "barn", a unit in nuclear physics derived, it seems, from the American phrase "big as a barn".

The remedy, as Professor Hogben argues (and as the academicians of the Quai Conti have known since the seventeenth century), lies in a greater concern for our language, and to this end he has provided the basic tools for the linguistic vigilante, consisting of a masterly summary of Greek and Latin grammar and about 100 pages of fascinating word-lists for both languages. It is interesting to reflect that, had Professor Hogben been about to goad an earlier generation, we might well have had "positon" (by analogy with meson and photon) instead of positron (by false analogy with electron), and by the same token we might have been spared such malapropisms as vitamin and motorcade (when "motorade" would have been etymologically correct, if no more elegant). Still more important, we might have been alert to the dangers that appear almost inevitably to accompany the transfer of a word between a vernacular and a technical vocabulary. Not everyone will fully share Professor Hogben's view that words like "allergy" and "sadism"—are necessarily debased in popular use through losing their precise technical meaning. anyone who has encountered soc logists groping for a gener acceptable definition of a mu used term like community, indeed any practitioner of one our new sciences seeking to est lish a "scientific" terminology recognize the wisdom with the reformers of eighteenth-c science eschewed the vernacular.

Within its garish dustjacket *Vocabulary of Science* has thing for everyone. The his may find some of Professor ben's judgments on the histor science curiously dated (espe perhaps, his scathing attitude influence of Aristotle), but surely be interested to see the ture of the German language posed as a possible ca German slowness to accept th chemical nomenclature of French. And the scientist, only with a dim recollection French or German course fo tists may find the didactic ters heavy going. Yet the stands as a warning here to us, scientists and non-sci alike. Our language, in science so many fields, is in danger; is in danger not from premed attack but from sheer ignoran indifference.

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Words, diagrams and numbers

BY I. J. GOOD

HOW MANY WORDS is a diagram worth? A thousand is the classic answer, and this is often ut right, give or take a factor of Perhaps most thought is linguis but most observation is visual and can accept information much through the eye than by any method. Visual information the further merit of being two- sional, whereas language is . Some fast readers can take ntage of the two dimensions of a of print, but they are rare. Of when a diagram is a straight ntation, such as a map or the graph of a face, a verbal or ic description could never psychologically adequate. Even is usually a mistake to rely on gram by itself without com . It is better to emphasize some main features in words. Think, example, of an electrical circuit ram.

r technical purposes every dia or picture can be expressed olically by listing the state of r at each of a large number of s in the diagram, each of these being specified by its two dinates. In effect this is what is when a picture is transmitted by sion or facsimile. The diagram ore or less in "one-one corre dence" with the symbolic repre tion, just like a graph and a al figures. But this correspond also has psychological merit. s the "national cake" is often rated with slices corresponding the fractions allotted to food, ds, professors and so on. For es have more emotional appeal tables and graphs. Sometimes actions are represented by bags, which might appeal even than cakes; but moneybags can leading, even deliberately, be it is not clear whether the s or the linear dimensions of bags are relevant. There are many ways of being deliberately mis ng with words, diagrams and bers, some of them very humor Perhaps numbers are the most pernicious when misused because they *look* so accurate.

Let us consider why quantitative results are so important in science. The answer is obvious in the applications of science, such as in engineering, or in the chemical industry, but less obvious when we are concerned with scientific explanation. Consider an example. Clerk Maxwell suggested that light is a form of electromagnetic radiation, and that, were such radiation produced, outside the optical range, it would be found to have the same velocity as light. When this is verified to say six places of decimals, then the theory has about a hundred times the odds it would have if the verification were only to four places. Or take another example. If we measure the circumference of a circle whose diameter is a mile, and find it is 3.14159 miles, we have obtained a good verification of the axioms of Euclidean geometry regarded as a branch of physics, although these axioms make little reference to numbers. If we could make the measurement to a few more places of decimals we would find that Euclidean geometry was refuted as the true geometry of space; at least if Einstein's theory of General Relativity is more correct. This is just one example of the importance of measurement in pure science.

Sir Arthur Eddington surmised that the ultimate form of the laws of nature would be purely qualitative, and retrospectively almost obvious, and that all numerical magnitudes would be obtained by deduction. For example, the ratio of the mass of the proton to that of the electron should be deducible. If Eddington's goal is ever achieved the whole of physics will be analogous to a kind of geometry. Hegel said that quality emerges out of quantity; Eddington in effect said the converse.

Words, diagrams, and numbers are between them still not enough for the communication of most of modern science. In addition it is usually necessary to use mathematics for an accurate exposition. The intelligent layman must often be satisfied with only a vague understanding if he is not something of a mathematician. But much can be done by appeal to analogies and spatial intuition by teachers who have mastery of their subjects and who are prepared to devote enough time to exposition. As Wittgenstein said in another connexion, "What can be said at all can be said clearly", and as Churchill might have added "and it can be said in half a page".

Even mathematicians find mathematics difficult to read. This is mainly because it is so condensed: it has almost no "redundancy" in the technical sense of the theory of information. Little did Churchill know how right he was: the whole of classical physics can be expressed in half a page—of formulas. But even a genius, starting from scratch, would not be able to understand these formulas without a great deal of blood, sweat, tears and sorrow. Mathematics can give exact description but it is almost useless without the support of terminological inexactitudes.

Finally something should be said of the media used for the communication of science. How to make the best use of these is clearly a question of first importance where education is concerned, whether this be for a select group of students or for the world at large. In the sciences there is a greater premium on lucidity than in the arts, although surprisingly it is often more difficult to achieve there: scientists unfortunately usually have less command of language in the lecture theatre than their literary colleagues. For this and other reasons, some students will learn better from books than from lectures.

Lecturers stand on pedestals, whereas good teachers encourage questions and answer them without sarcasm, however stupid they might appear to be. The author of a good textbook has a harder task here since he should guess what questions are likely to be asked and should answer them in advance. It is more economical to use illustrations in a book than it is in a classroom. Slides, of course, can be produced, but the effort required by the student is greater than were he examining them in a book, and some students will go to sleep when the lights are lowered. Slides may be projected from behind frosted glass so as to avoid this objection, but this is more expensive in equipment and in space than the usual method.

Films and television programmes share one of the advantages of the book in that since they are addressed to a large audience it is economical to invest heavily in their preparation. Of the two, films are more effective because they are more hypnotic, but in principle television could also be projected on to a large screen. Both media have the disadvantage of no immediate feedback from the students, whereas computerized instruction has feedback in one direction—that is, the computer can ask questions but is not yet good at answering them. This is why "computer-assisted instruction" is a better name. Many students find it less embarrassing to reveal their ignorance to a computer than to a human teacher and a class of boisterous youths.

The feature of asking questions can be incorporated in books of "programmed instruction". The computer has the advantage over such books in that well-designed computer programmes can be readily brought up to date. The preparation of computer teaching programmes involves a great deal of work and is perhaps not yet economic, but it will become so when the so-called "computer utility" becomes a reality.

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Refurbishing faded images

FRITZ FISCHER :
Krieg der Illusionen
Die deutsche Politik von 1911 bis 1914.
805pp. Düsseldorf: Droste. DM30.

Just forty years ago a young German historian, Eckhart Kehr, published his first—and unfortunately last—major work, *Schlachtflottenbau und Parteipolitik 1894-1901*. Kehr was one of the first German historians who discarded the methodological assumptions of the classical German school of historiography by attempting to introduce the generalizing techniques of the social sciences. He turned his back on the "world historical individual" and "the state" as the major forces shaping history, and instead looked more closely at the interaction of socio-economic with institutional factors. Though it can be argued that his work strongly exaggerated the importance of capitalist forces in the making of the German High Seas fleet, Kehr had nevertheless explored a new avenue in German historiography which might have been extremely fruitful had it not been for the rise of Hitler, Kehr's untimely death in 1933, and his own passionate political commitment which frequently intruded into his scholarship and made many of his judgments open not only to criticism but also to question. His work virtually disappeared into oblivion.

Of course, Kehr's commitment is perfectly explicable: he was branded by the defeat of 1918, which drove him to search for its causes at levels deeper than the ripples made by documents relevant only to diplomatic and military history. Now, forty years later, the Hamburg historian Fritz Fischer continues to try to follow in Kehr's footsteps, an attempt begun by his study of German war aims during the First World War which culminated in his first major work, *Griff nach der Weltmacht* (1961). In that book the question of the responsibility for the outbreak of war was marginal, confining itself to a statement that Germany during the July crisis had accepted the risk of a European war. Even that upset historiographical orthodoxy; under the pressure of public controversy Fischer's attitude changed, and in his present work he puts forward the thesis that from 1911 the German Empire desired war, prepared for it, and ultimately provoked it in 1914.

Fischer's work is branded not only by defeat but also by the German nation's moral bankruptcy. How far this involved him personally is difficult to judge. However, as late as 1938 and 1939 he allowed his research to be subsidized by Walter Frank's notorious Nazi Reichsinstitut für Geschichte des Neuen Deutschlands, and this may well have occasioned the fervour of a prosecuting counsel which marks Fischer's work. To be sure, Fischer's are not the sharp, incisive rapier-thrusts of Kehr but mighty sledgehammer blows, which pound into a predetermined shape material of almost overwhelming dimensions. Quotations from official documents, private correspondence and newspapers are cited *in extenso*, interspersed with statistical tables and maps. All this is, as in his earlier work, held together by extremely tedious prose. Apart from the absence of repeated references to the historical insights of Comrade Ulbricht which mar the work of the East German historians' collective under Fritz Klein, *Deutschland im Ersten Weltkrieg*, Fischer's new book is just as difficult to read.

Yet in spite of these shortcomings Fischer's work is as essential for the specialist as is the three-volume production of his East German colleagues. As in his study of Germany's war aims, it is above all the wealth of materials which Fischer collected in both German states which gives his work particular value.

If, in spite of Fischer's excessive literal-mindedness, all the sources have been correctly cited, the question remains whether they are not open to differing interpretations; answers will emerge in the debate which this book will inevitably instigate. It may fully vindicate him; on the other hand it may not. It may well substantiate the impression a first reading of his work gives: that is, a preconceived pattern which determined selection and interpretation, and which in turn may have caused him to commit serious errors of the nature cited by the late Gerhard Ritter, who convincingly demonstrated that, in his treatment of the Belgo-German feelers for a separate peace, Fischer had read one page of a document but missed—or omitted—the following pages, which considerably change his account. Certainly, in *Krieg der Illusionen* the substantiation of his reference to the domestic policy of Puttkammer with nothing more substantial than Kehr's own essay on the subject, itself based in the main on secondary sources, points towards this possibility. However, in a monograph of this scope minor errors of fact are inevitable: and Fischer's modification of hitherto accepted orthodoxy is itself a considerable achievement.

Fischer is consistent to his previous portrait of Bethmann Hollweg as a man holding a very definite view of Germany's political and economic objectives. Engulfed in a wave of fatalistic nationalism, Bethmann Hollweg went down the path advocated by the German military, financial, industrial and agrarian interests, and by the press dominated by these pressure groups. But this immediately raises the question whether these groups were really so monolithic and homogeneous in their structure as to share identical aims?

For the armed forces the answer is simpler than for the rest. Ever since Agadir the General Staff had become increasingly subject to a feeling of claustrophobia—"encirclement" was considered a real factor, especially in view of Russia's military reorganization. But when in the wake of Agadir Tirpitz demanded from Bethmann Hollweg that he give the German people a great aim worth striving for, the Chancellor simply replied: "What aim?" Hardly the answer of a man determined on a course of war for the sake of imperialist expansion. Fischer does not mention this incident, any more than the identity of opinion that existed among British and German diplomatic and military staff in their appraisal of Germany's position vis à vis the growing Russian potential. As late as March, 1914, Sir George Buchanan summarized Germany's military dilemma with the words: "Can Germany afford to wait till Russia becomes the dominant factor in Europe or will she strike while victory is still within her grasp?" Sir Henry Wilson, too, after examining the Russian arms programme commented that "it's easy to understand how why Germany is anxious about the future and why she may think that it is a case of now or never". Moltke and his staff were increasingly obsessed by the conviction that war was inevitable, and therefore the sooner it came the better for Germany. It would seem to follow that there exists a natural distinction between on the one hand "preparation and provocation" and on the other preparation and consideration of the most favourable circumstances in which an apparently inevitable war could be fought, both from the military point of view and that of German domestic politics. Sarajevo provided the occasion, but even then the immediate expectation was of a rapid Austrian counter-action. Only Austria's delay allowed the fronts to crystallize.

Although Fischer readily admits that the phenomenon of economic imperialism was common to all industrialized nations, Germany's unique feature was that she was the last on the scene and hence acquired only a small share of overseas possessions; her economic penetration of areas under the influence of the other European great powers was bound to cause friction. Moreover, *Weltpolitik* was to be an integrating factor in a society still divided by the rifts of Bismarckian policies. So far so good: but Fischer gives the impression that its racist and social Darwinian tendencies represent an equally unique corollary to Germany's policy. This impression, already conveyed in *Griff nach der Weltmacht* and in the work of some of Fischer's pupils, has led one German historian to credit Fischer's school with the discovery of social Darwinian currents in the German political thought of the period, particularly because of their presence in the Riezler diaries. Forays made in this direction by Jacques Barzun or Richard Hofstadter seem to have been overlooked.

The hypothetical alternative of internal revolution or democratic reform as a result of the 1912 elections is in itself not new, though Fischer adds vastly to the stock of quotations extracted from a wide spectrum of periodicals and private papers. But generally speaking, if the forces of democratic reform were to be checked at all costs—and after all they did exist even before 1912 — what point was there in Bethmann Hollweg pushing through the constitution for Alsace-Lorraine, which by comparison with the Prussian constitution contained some highly democratic features, including universal suffrage?

Apart from this one would like to know a little more of the actual influence and impact of each of the newspapers and journals quoted. What are Fischer's criteria in measuring them? What were their circulation figures? In the final analysis Germany, unlike Britain, never had anything approximating to a "national press" (Hitler's twelve years excepted). Germany's press was mainly—and in West Germany still is—regional. The journal of the Pan-Germans never exceeded a circulation of 6,000 before the outbreak of war.

Germany's economic imperialism as such hardly required a war to achieve its objectives in the long term. Fischer himself demonstrates the degree to which the European economy was becoming increasingly integrated. In the Near East German economic penetration was, at least to Great Britain, preferable to Russia's physical presence, especially in view of Russia's policy in Persia during that period.

No doubt, by concentrating on social, economic and institutional factors, Fritz Fischer has in his new book further cleared a path through the undergrowth of diplomatic history. Nevertheless, after reading almost 800 pages of text, one cannot help feeling that *Krieg der Illusionen* represents the work of a man who has set out to rewrite history from scratch; to produce, in a German context, as it were an anti-Ritter.

Yet both Fischer and Ritter seem to share the same fundamental failing in so far as they both thought it relevant to analyse the problems they handled in terms of "national history". In 1914 the European states were already economically interdependent and currents like "imperialism" or "social Darwinism" are, it is suggested, of greater relevance when analysed on a comparative basis and within the framework of international relations, particularly when their consequences culminate in two world wars and Auschwitz and Hiroshima.

It has been maintained that "history is a weapon of struggle". Maybe. If so it is the ends of the struggle that matter. There are those, allegedly a diminishing species, to whom Fischer's new work will be welcome as a means of refurbishing faded national images. However, to those who are able to use it as a major piece in the complex mosaic of international relations, *Krieg der Illusionen* will be a boon, though only after refinement and reshaping by the reader.

Parallel powers

PAUL DUKES :
The Emergence of the Super-Powers
A Short Comparative History of the U.S.A. and the U.S.S.R.
155pp. Macmillan. £2 (Paperback, 20s.)

Historical analogy is an entertaining sport, but one usually practised only by amateurs. Professional historians tend to look askance at interpretations of history which equate Britain with Athens, Germany with Sparta, the United States with Rome, and so on. But the analogy between the United States and Russia has more respectable authority than most, and Mr. Dukes is inclined to treat it seriously. Earlier variations on the theme have been advanced by intelligent observers since the eighteenth century: Baron Melchior von Grimm in 1790 is the earliest case quoted by Mr. Dukes, followed by Tocqueville in 1835, Marx and Engels in 1882, and D. H. Lawrence in the present century. So there is at least a prima facie case to be considered for the theory of parallel development between the two superpowers of today. It is appropriate that the case should be elaborated by an American scholar specializing in Russian history and teaching at a British university. The result is an intellectual diversion of much merit, though what moral or lesson it teaches is more difficult to say.

Mr. Dukes starts with the prehistory of his theme in the seventeenth century, when Russia and the American colonies already had certain experiences in common. Both were in the early stages of capitalist development; both were moving towards a more centralized form of government; both were directly affected by wars in Europe; both were facing the problems of an unsettled frontier. But both were also awaiting a new impetus before they could grow into full nationhood, and it did not come in either case until the following century. In the case of the United States the impetus is easy to identify in the War of Independence; but it is harder to find a corresponding force in Russian history. To compare Washington and Pugachev, as Mr. Dukes does, is far-fetched. It is clear in fact that the crucial impetus in Russian history came a generation later than in the United States, with the Napoleonic Wars. This is only one example of a phenomenon which more than once upsets the symmetry of Mr. Dukes's thesis. Though the two histories may be moving in parallel, they are often out of phase.

They come together again more neatly in the nineteenth century. The year 1812 has a symbolic importance for both Russians and Americans: the French occupation and burning of Moscow is matched by the British occupation and burning of Washington. The effect of the war on both nations makes this more than a superficial parallel. So does the effect on both of later, though very different, wars in the second half of the century. It was the Crimean War that initiated the modernization of Russia, just as the Civil War did that of the United States. Both wars also led to the abolition of slavery or serfdom in the two countries, within a few years of each other. What was more important, the two countries began to take notice of each other and to learn deliberately from each other's experience. One of Mr. Dukes's most interesting passages describes how American educators had their eyes opened to the possibilities of industrial training by the Russian exhibits at the Philadelphia Centennial Exposition in 1876. At the same time American schools attracted more attention from educational innovators in Russia than they did from anyone in Western Europe.

There were of course also fundamental differences between Russian and American society. Whereas Russia was a land-locked pow surrounded by frozen sea hereditary enemies, the U States was open to the ocean had virtually nothing to fear territorial neighbours. There also sharp disparities in dev ment: the United States was fa advance of Russia in literacy, communications and in econ growth; whereas Russia had of the American problems of population, immigration and zation. The similarities are now less impressive, even if some them are merely superficial co dences (for instance, that both their head of state by assassin in 1881). Perhaps the most sig cant of the similarities, in the of later developments, was the gence in both countries during last quarter of the nineteenth tury of a political movement ing the label of populism. It not the same in each case: America it sprang from the roots, whereas in Russia it was by intellectuals and largely con to them. But the anti-industri bias of the movement was the in both countries; only in Russ was seeking to avert the con quences of industrialization be it arrived, whereas American po lists were registering a protest behalf of a rural society al doomed by the rise of the indu city. Once again, the two coun were moving on parallel lines out of phase.

In the twentieth century the pro ess became both accelerated subtly changed. What we are witnessing is a paradoxical mo ment which can only be expres in terms of non-Euclidean geom for the Soviet and American ci zations are not merely moving parallel lines but also converg This phenomenon has been remarked before, but Mr. Du elaborates it with a striking of examples. They range from equation of the October Revolu with the New Deal to purely sonal identifications — Pre Wilson with Lenin, Heming with Sholokhov, Marshal Z with General MacArthur, Zh with Senator McCarthy. It these recent years that one ca most clearly the differences as as the similarities between the great nations. Circumstances forced them to the forefront power in international relations consequently into a mutual co tation. The facts of econom have also imposed a degree mutual assimilation on the United States now moving to a quasi-socialist economy just Soviet Union is moving towa quasi-capitalist one. But the intriguing point is one to which Dukes perhaps gives insuffi emphasis. In so far as na characters can be stereotyped, are marked psychological aff between Russians and Ame but they have reacted to the opposite ways. Both are rebels, resenting all forms of pline and liable to uncontr outbursts of violence. The A cans have solved their prob maximizing freedom under the of a democratic society; the sians have solved it by impos themselves the severest imag tyranny.

It remains to be seen how next stage of their interaction work out. Mr. Dukes argues whereas the First World War erated the differentiation of the societies, the Second World accelerated their assimilation are now unquestionably the two superpowers in the world it is difficult to believe that will still be the same in fifty time, or even by the end of century. Mr. Dukes ends his lating and thoughtful study mildly optimistic note. He does set himself up to be a prophet as he reasonably concludes, know where societies are going necessary to know where they come from".

Science and the modern historian

BY MARGARET GOWING

WE DEFINE contemporary ry as the history of the twen h century, the most profound irreversible changes it encom s are scientific and technologi The rise and fall of empires, classes, economies and social are dominated by them. We so told that 90 per cent (or is it?) of all the scientists who ever lived are alive today. Yet ically that long-established line, the history of science, concerned itself very little with entieth century, and that newly ded specialism, contemporary has concerned itself scarcely th science and technology. history of science has been cially esoteric discipline con primarily with the history of and with the frontiers of sci and philosophy. Some scholars, ample Stephen Toulmin and Goodfield, have attempted is and explanation for a less lized audience and have also d a long time-scale reaching present; but most academic of science so far has been microscopic or even submicro scale. It has not concerned much with wider relationships ence and society and its work erwhelmingly concentrated on periods before 1800, as a glance e volumes of the *British Journal* r *the History of Science* show.

owever, in this whole area there been signs of change. Taton's ral *History of the Sciences* has lume on the twentieth century. t notably, the American In of Physics has established the important New York Center e History and Philosophy of o to study not only the devel t of scientific ideas in twen century physics but their social t in the community of scien and society at large: the is collecting a large archive of written and oral material for this purpose. American initiative is also launching a multi-volume *Dictionary of Scientific Biography* which will certainly include twentieth-century scientists, as does the one-volume *British Biographical Dictionary of Scientists*. The recently announced *Journal for the History of Astronomy* emphasizes that it will go up to the present day, and one of the main features of the first number of *Studies in History and Philosophy of Science* is an article on quantum physics.

If the historians of science and technology are now moving into the twentieth century can the "ordinary" mainstream historians of the period, the contemporary historians, decide with relief to leave these problems alone? Of course not. The best of the "ordinary" historians who study the earlier centuries well cultivated by historians of science would regard it as unthinkable to keep off their colleagues' territory: they would believe their understanding of their period to be hopelessly impoverished without a knowledge of the scientists and technologists and their interactions, often subtle, with society.

Few contemporary historians seem aware of their impoverishment. They have often done more than their colleagues who write about previous centuries to relate economic and social affairs with domestic and international politics. But for the most part they pass by science and technology (except for the more obvious industrial manifestations). They do not concern themselves with science and technology as a pervasive influence on the topics—political, international, economic, social and cultural—which are their stock-in-trade. Nor do they see scientific history as part of their own catchment area of research: by scientific history I mean the history not only of ideas but of scientific projects, of the scientists themselves, of their institutions, of their relations and communications with each other and with their governments.

Certainly Geoffrey Barraclough gives the whole subject its proper importance in his *Introduction to Contemporary History*, and so does Alan Bullock in a recent article in *The Listener* (March 19) about the seminal years before the First World War. But they are exceptional. In three of the main narrative textbooks about Britain in the twentieth century—C. L. Mowat's *Britain Between the Wars*, L. C. B. Seaman's *Post-Victorian Britain* and A. J. P. Taylor's *English History 1914-45*—the pages devoted to the scientific upheavals of the period are minimal. A fourth textbook, Arthur Marwick's *Britain in the Century of Total War*, has more pages, but they are not commensurate in number or content with the subject's very great importance in relation to war.

Some of the new popular histories—the weekly *History of the Twentieth Century* and the series "The Making of the Twentieth Century"—do include science, but the contributions seem to be largely by scientists rather than by "ordinary" historians. It is significant that the *Journal of Contemporary History*, which is now four years old, has in its lifetime published no articles on science and only one on technology (as it has affected the Middle East). Where historians have written about recent scientific or technological projects they seem to have done so at the request of the project organizations, as in the cases of the volume in the Official Second World War Histories by M. M. Postan and others on the *Design and Development of Weapons*, Asa Briggs's *History of Broadcasting*, and my own atomic energy history. Similarly such twentieth-century technological history as has been written is mostly embedded in the history of firms such as that of Courtaulds, written by D. C. Coleman.

It is clear that British historians are not the only ones to neglect science. Last year a book, *Contemporary History in Europe* (edited by D. C. Watt), had contributions about the work in progress in most European countries, East and West, and I found in it three not very prominent references to science and technology. Histories of international affairs in the period since the Second World War do of course concern themselves with nuclear weapons, though I recall that at an international conference of contemporary historians in 1966 none of the papers on the cold war mentioned the atomic bomb. Apart from weaponry, historians tend to concentrate more on the traditional material of diplomatic history than on new and complicated scientific and technological cross-currents. F. H. Hinsley's *Power and Pursuit of Peace* is one of the rare exceptions in its perception of the background of technological change.

It seems then that the main body of academic contemporary historians have opted out of, or have not opted into, one of the most important areas of twentieth-century life. Their colleagues in other faculties are less hesitant. Science is a cumulative discipline and many scientists, including the greatest, are historically minded. A few of them in our generation have transferred this interest to paper, writing sometimes about the history of science (including recent science) in the broad, as in the case of J. D. Bernal, and sometimes about their own experience, as in the case of James Watson and his *Double Helix* or some of the scientists who wrote about their wartime experiences of, for example, radar or jet engines. Sir Solly Zuckerman and Lord Blackett have both looked back with important and more general reflections on wartime scientific history.

Socal scientists—a few economic historians (notably D. L. Burn) and an increasing number of economists, political scientists and sociologists—seem readier than contemporary historians to study the impact of science and technology on twentieth-century society. For example, the work of Richard Titmuss, who pioneered social administration as an academic subject, is grounded in history and his analysis of welfare in general and health services and the medical profession in particular is firmly rooted in the scientific revolution of our time. W. H. G. Armytage, an historian of education, has paid special attention to the rise of the technocrats. It is political scientists rather than historians who have begun to study developments in the relationships between science and government and articles on such subjects appear not in the historical journals but rather in *Minerva* or the journals of political science. Jacques Ellul, whose book on technological society embraces philosophy and history, is a member of a faculty of law.

Among academics, natural scientists and social scientists are writing about science and technology in a historical dimension. Journalists are also increasingly entering a territory where workers are so thin on the ground. Much modern scientific journalism has been of a high standard and we owe a great deal to several of its practitioners who combined it with scientific history—for example J. G. Crowther and Lord Ritchie Calder and more recently Ronald Clark who, starting as a journalist, has become a considerable scientific biographer. Biography is one of the traditional arts of the professionally trained historians, but here too, they keep away from scientists and offer Mr. Clark no competition. The scientific history of some other journalists who have eschewed the rigorous methods of the historian—hypothesis, examination of evidence, revision of hypothesis—has been much less happy. Lack of such methodology made,

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the recent biographical study of *Lawrence and Oppenheimer* (reviewed in the *TLS*, December 18, 1969) by Nuel Pharr Davis (albeit a Professor of English, not a journalist) of little value even though it took seven years to write.

Other disciplines and professions are, it seems, stepping in where contemporary historians fear to tread. This is apparent in the universities. Specialist units for the study of science in society have been established in American universities and in this country at Sussex, Manchester and Edinburgh, and my impression is that there are very few "ordinary" historians on their staffs, while those that do join seem then to loosen their links with the mainstream historical profession. I believe that this is most unfortunate, for I am convinced that we need bridges between science and history.

We need, inside science and society or science policy units, historians with wide perspectives who will study scientific affairs but also keep open the lines of communication with historians concerned with such normal topics as international relations, working-class movements, or domestic politics. But we also need contemporary historians concerned with science and technology in history faculties. Universities put on history courses about the twentieth century which scarcely mention science and technology, and humanities students learn nothing about the development of these powerful influences which they so mistrust and dread. From advance publicity it seems that the Open University may provide an honourable exception.

This is in short a plea that "ordinary" contemporary history should assert itself as an integrating study: it should for any topic or period follow through the immensely complicated inter-relationships between human individuals, political, economic, social, cultural and scientific factors, rather than concentrate excessively on any of them, as do the specialized compartments of history. This is a tall order indeed, because it means that historians must master much theory in a great many disciplines. In fact it is often suggested that contemporary historians are frightened away from science because it is too difficult. But specialist historians of the science of earlier centuries have always been drawn from "ordinary" historians as well as from philosophers and natural scientists, and many good scientific journalists are not scientists by origin. It is also worth remembering that archaeologists have managed to master sophisticated scientific tools, that many humanities people acquire computer skills and that administrators with history degrees in the civil service or industry must often these days cope at a more than superficial level with scientific and technological problems.

It would no doubt be extremely difficult for anyone without a scientific or mathematical training to understand scientific reports in order to write a detailed account of a modern scientific idea. But such detail is not necessary for the broader history of science and technology which I am advocating. It is essential to grasp enough theory to be able to understand the scientific and technological possibilities at any moment of time, the reason why one choice was made rather than another, the consequences of the choice, &c., &c. This is certainly difficult but not impossibly so. I speak from experience, for I began to write atomic history from a starting-point of complete scientific illiteracy. I am still very ignorant in many scientific affairs but I can talk to the scientists (who have [illegible] all been extraordinarily [illegible] helpful) and read the [illegible] with sufficient understanding [illegible] relate the scientific and tech[illegible] cal developments to all [illegible] other issues—political, admi[illegible] tive, economic and social [illegible] arise in the history of the [illegible] energy project. Learning enou[illegible] ence to do this has not seemed [illegible] inherently more difficult than [illegible] tering, for example, some [illegible] theological controversies or the [illegible] guage of some of the more [illegible] dite sociologists.

Because twentieth-century [illegible] exceedingly complex and the [illegible] of change so swift, the ta[illegible] contemporary history seem [illegible] impossibly demanding. But [illegible] sure that historians will betray [illegible] profession if they attempt [illegible] plify the tasks by tacitly [illegible] the science which pervades [illegible] aspect of our lives.

The Frenchman who dug under the Thames

PAUL CLEMENTS:
Marc Isambard Brunel
270pp. Longmans. £3 5s.

Along with such names as Rennie, Whitworth, Nasmyth, Maudslay and Telford, that of Brunel has long been revered as one of the most illustrious in early nineteenth-century British engineering. And just as two generations of Stephensons were at the forefront of civil and mechanical engineering developments, so it was with the Brunels.

Of the two, Isambard Kingdom Brunel is the better known; his colourful personality, technical vision, and association with such spectacular fields as railways, ships and bridges have made his life and work conspicuous. His father, teacher and colleague, Marc Isambard Brunel, has tended to remain a rather shadowy and neglected figure, better known as the father of a famous son than as an engineer in his own right. Mr. Clements has done a splendid job in putting this situation to rights.

Born at Gisors in northern France in 1769, Marc Brunel displayed a talent for technology at an early age, a talent which might well have benefited his native country but for the French Revolution. Marc's royalist sympathies obliged him to escape to the United States in 1793, though his stay in New York and Philadelphia lasted only six years and this phase of his life occupies only a few pages of the biography.

The second part of the book deals with the period between 1799 and 1825, from Marc's arrival in England (soon after which he married Sophia Kingdom) to the beginning of the Thames Tunnel. For historians of technology this is perhaps the most valuable portion of the story. The first quarter of the nineteenth-century saw Marc Brunel at his most diverse as an engineer and prolific as an inventor. This was the period when he developed his famous block-making machines and thereby laid the foundations of mechanized mass production which was to become such a basic feature of industrial production throughout the world. It is intriguing that into the well-established and highly skilled technical world of men such as Henry Maudslay should come a foreigner with distinctly original ideas of his own and the energy to realize them. Moreover it is interesting that Brunel was in fact turning his technical skills and insight against his own country, since his block-making machinery was used to equip the British Navy for its contest with the French.

The block-making machinery was one of the earliest of Brunel's patents, but more followed in a variety of fields such as timber working, printing, and prime movers. Not all Marc Brunel's mass-production ventures, however, were ultimately a success, at least not in economic terms. He developed, for instance, the means to mass-produce army boots during the latter years of the Napoleonic Wars, a not insignificant factor, according to the author, in the British army's eventual triumph. But within months of Waterloo Marc found himself with far more boots than the rapidly disbanding army could possibly make use of. Mass-production techniques involve more than technological changes; finding outlets and anticipating potential markets are also essential facets of the process.

Mr. Clements's first appendix is a list of Marc Brunel's patents, of which the last was taken out in 1825. It is evident that the year marks the beginning of a new phase in his operations. Isambard was then nineteen years old and the Thames Tunnel, conceived early in the 1820s, was begun in March. Most previous studies of the Brunels have concentrated on the period after 1825, with Isambard as the central figure—the Thames Tunnel being his first important project. Now we have an account of the work written more specifically from the father's angle, a valuable complement to existing studies.

Mr. Clements in fact devotes the greater part of his book to the construction of the first subaqueous tunnel in the world; his account essentially follows the [illegible] lines as that published seven [illegible] ago in David Lampe's *The T*[illegible] And yet the story bears rep[illegible] well. The Brunels' personal [illegible] with an endless succession of [illegible] culties—technical as well as [illegible] technical—is still an ab[illegible] story. And, seen against the [illegible] ground of Marc's earlier [illegible] in mechanical engineering, [illegible] famous tunnelling shield—the [illegible] version of such a device to be [illegible] successfully—appears more [illegible]. It is a typical example of the [illegible] tor's fresh approach to proble[illegible] and his conviction that whenever [illegible] engineering operation could [illegible] mechanized it should be.

The literature on the two [illegible] works of influential British [illegible] neers (surely it is right to regard [illegible] Brunel as a British engineer [illegible] though he was not a Brit[illegible] growing, and Mr. Clem[illegible] book is a valuable ad[illegible] to the list. Indeed, having read [illegible] very well written biography [illegible] all the more surprised that [illegible] Brunel has remained unstudied [illegible] so long, even allowing for the [illegible] doubled counter-attractions of [illegible] bard. The father is in fact [illegible] nating figure.

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The British who built at home

L. T. C. ROLT:
Victorian Engineering
300pp. Allen Lane The Penguin Press. £3 3s.

This latest work from one of England's best known writers on engineering history is the broadest in scope of any of Mr. Rolt's books. It is essentially a review of Great Britain's rise to industrial greatness in the first half of the nineteenth century and its displacement from a position of world supremacy in the second half.

The first half of the book deals with well-known themes: the railway engineers and their work in both civil and mechanical engineering; the machine-tool makers; steam powered ships; and iron working and coal mining. A welcome inclusion is the mechanization of agriculture and food handling. The Great Exhibition of 1851 forms the pivotal point of the book and is followed by material on the gas industry, electro-technology, civil engineering and steel making.

Mere chronological accounts of technical history are numerous. Any attempt at explanation and analysis however is less common (on this side of the Atlantic that is; in the United States scholars are much more inclined to probe beyond what happened in an effort to find out why it happened and what were the consequences), and Mr. Rolt's assessment of Britain's pioneer industrial triumph and the onset of decline is the aspect of his book most worthy of attention.

The book is quite short—less than 300 pages—and from this one can make a number of observations. At this length a history of the whole of nineteenth-century British engineering is bound to be a survey. Even if it were only a straightforward account of technical developments, it could not be very detailed. But being interpretative as well as informative, the coverage is correspondingly thin. There is a case for such an approach, and many readers will doubtless benefit from this panoramic view of the subject. As such it is a not unsuccessful book.

One cannot help wondering, though, if an opportunity to write a different sort of book has not been missed. Could not the standard technical history have been played down in favour of a more exhaustive study of this highly interesting phenomenon of shift in technological leadership? It may be that the rise of Germany and the United States, and in certain fields of France, Switzerland and Italy also, was due not so much to Victorian self-satisfaction and lack of perception, as to a natural and more fundamental tendency for technological development to experience a kind of leap-frogging action from one country to another. To take a recent example, is it the case that Japan's amazingly rapid technological development is due to a failure on the part of Western Europe and the United States of the same sort as Mr. Rolt claims afflicted Victorian Britain? Or is there some other force at work, such as the possibility that Japan examined how and how not to pull off an industrial revolution and then set about the job mindful of the pitfalls?

When one begins to analyse technological change and interaction in the past 100 years or so, the approach must surely be international. Mr. Rolt on the other hand has written largely from a British standpoint and attributed the decline to mainly internal factors. This tends to undervalue developments in other countries which were epoch-making in their own right and did not depend for their effect on a weak response (or no response at all) from a Britain besotted by its own success.

The only dams mentio[illegible] those of Vyrnwy, Thirlm[illegible] the Elan Valley. These [illegible] tainly the biggest to be [illegible] Great Britain during the p[illegible] at the international level [illegible] of limited significance. [illegible] rather puzzling is that no m[illegible] made of the much more im[illegible] dams built by Victorian [illegible] abroad; the Tansa and [illegible] dams in India for instance [illegible] first dams ever built across [illegible] at Assiut and Aswan. Al[illegible] of the nineteenth century [illegible] engineers were carrying out fine work abroad in many [illegible] yet these activities are not dis[illegible]

Entomopathology

JAROSLAV WEISER:
An Atlas of Insect Diseases
292pp. Shannon: Irish University Press. Prague: Academia. £7 10s.

The diseases of insects are most important factors, not only in the rearing of economically valuable species (bees, silk worms, &c.) but in the understanding of "natural" mortalities in the field and in the interpretation of results from insecticide trials. True insect pathogens fall into six groups: fungi bacteria, rickettsiae, viruses, protozoa and helminths, each of which receives a short but informative chapter in this book. Intracellular symbionts or non-pathogenic organisms [illegible] the gut of insects are not [illegible] The pathogens are very [illegible] trated in the plates but the [illegible] sion of diagrams in the text [illegible] have been helpful to those [illegible] ning the study of insect patholo[illegible]

Dr. Weiser, who organi[illegible] First International Confer[illegible] Insect Pathology in Prague [illegible] is now Head of the Depart[illegible] Insect Pathology of the [illegible] slovak Academy of Sciences [illegible] Dr. B. Rosický he has written [illegible] *ern Insecticides* (1951) and [illegible] *Entomology* (1952). The [illegible] *Atlas* is another most useful [illegible] bution to entomology even [illegible] is confined to a rather selec[illegible] specialists.

Brains and bumps

[illegible]RT M. YOUNG:
[illegible] Brain and Adaptation in the [illegible]eenth Century
[illegible] Clarendon Press: Oxford [illegible]ersity Press. £3 5s.

[illegible] Young, in moving from medi[illegible] to psychology, has found our [illegible] descriptions of the activity [illegible] the brain, though useful for [illegible]ting for the simplest of sen[illegible] and motor behaviour, quite [illegible] as a basis for describing [illegible] behaviour and, in particular, [illegible] differences in behaviour and [illegible] between one man and [illegible]er. No one would quarrel with [illegible] In looking back to the nine[illegible] century for the origins of our [illegible] views, he has decided, again [illegible]tly, that the idea of localiza[illegible] of function in the brain is one [illegible] the key concepts.

[illegible] know that there are localized [illegible] areas in the brain which [illegible] impulses from eye, ear, the [illegible] surface and so on and we are [illegible] sure that there is a motor area [illegible] can be excited electrically to [illegible] movements of all parts of the [illegible]. These facts were firmly [illegible]ished by Fritsch and Hitzig [illegible] Ferrier from 1870 onwards. [illegible] farther back, Dr. Young [illegible] encountered Gall, the originator [illegible] cranioscopy or phrenology, who [illegible] forward a totally different [illegible], a system of cortical localiza[illegible] indeed, but a localization of [illegible]-six attributes which Gall, on [illegible] sketchiest of evidence, declared [illegible] localized in particular areas of [illegible]ain.

[illegible] attributes or propensities [illegible] from a "commonsense" view [illegible] observable human behaviour. [illegible] may have been derived from [illegible] general attributes of the philoso[illegible], but they have suffered a [illegible]. Memory, for example, has [illegible] split up into memory of people [illegible] memory of things. A new [illegible] of attributes, amativeness and [illegible]progenitiveness, perhaps fore[illegible] later psychologists. "Sens de [illegible]" reappears, admittedly in a [illegible] part of the brain, among [illegible] modern localizations due to [illegible] of patients with right parietal [illegible] lesions. Sense of balance, again [illegible] a different localization, has a [illegible] equivalent. Dr. Young has [illegible] illusions about the nonsense [illegible] by Gall; his arbitrarily chosen [illegible]ories, and the total lack of [illegible] evidence for their localiza[illegible]. Nevertheless he maintains that [illegible] an important figure in nine[illegible] century science, that as [illegible] those like Flourens who [illegible] that the brain was one and [illegible], Gall was right, and that [illegible] a great influence on the [illegible] of nineteenth-century [illegible]. Furthermore, that while [illegible] motor physiology of the [illegible] allied to an associationist psy[illegible] is not much help as a basis [illegible] of human behaviour, [illegible] categories are more [illegible] and more relevant. This is [illegible] claim but not one [illegible] Dr. Young has completely [illegible] out.

[illegible] system of phrenology [illegible] from the observation of a [illegible] friend with a remarkable [illegible] and prominent eyes. [illegible], he felt, must have a local[illegible] in the frontal lobes of [illegible] which pressed down on the [illegible]. Observations of other individ[illegible] led Gall to produce twenty-six [illegible] which were correlated with [illegible] of different parts of the [illegible]. Gall lectured well and widely. [illegible] from teaching in Vienna [illegible] of objections from eccle[illegible] authorities because of the [illegible] and fatalistic flavour of [illegible], he settled in Paris. His [illegible] Spurzheim and Combe, [illegible] doctrine in England and [illegible] where it flourished exceed[illegible]. Numbers of phrenological [illegible] sprang up. Archbishop [illegible] absolved it from the cen[illegible] Catholic authorities in [illegible] "All moral and religious [illegible] against the doctrines of [illegible] are utterly futile." Dr. [illegible] Chalmers of Edinburgh [illegible] blessing, and A. R. Wallace pronounced it a true science.

Its downfall was slower, a few faithful survivors continued into this century, and the present reviewer had his bumps examined at a tender age during the First World War. In the 1830s the *Edinburgh Review* and *Blackwoods* savaged it, Rowlandson and the French caricatured Gall, and it finally sank from the weight of its own absurdities. A murderer whose bump of benevolence was well developed, a girl whose amativeness was not in doubt but whose cerebellar bump had atrophied from overuse, four areas for appreciation of weight, colour, order and concentration which in fact overlie the air-filled frontal sinus—there is no end to the tale of absurdities. Gall can even be said to have helped in the development of scientific method and, in particular, statistical inquiry, since his opponents pressed for systematic and not anecdotal methods, the search for contrary instances rather than the indiscriminating accumulation of favourable cases.

Undoubtedly Gall insisted that brain was the organ of mind, and that there was some localization of function in the brain. It is worth looking at a list of his faculties, however—a list which Dr. Young does not provide. His own names include "Instinct de la génération"—posterior midline, referred to the cerebellum, and "amour de la progéniture" immediately above, usually prominent in apes and women, "Instinct carnassier" above the meatus of the ear, large in the head of a student so fond of torturing animals that he became a surgeon and large in the head of an apothecary who became an executioner. "Orgueil", "bonté", "vanité", "circonspection", "sentiment religieux", "poésie", "mémoire des personnes", "mémoire des choses", "esprit métaphysique", "sens de localité", and so on. These were divided by Spurzheim into propensities, lower and higher sentiments, perceptive and reflective, and clearly they are a very heterogeneous group.

In spite of the fact that his localizations were nonsense and his proofs never better than anecdotal, Dr. Young maintains that Gall's work had immense impact on the nineteenth-century psychologists and philosophers, through George Henry Lewes and Spencer, and through him on Hughlings Jackson, and on Bain whose declared aim was to bring psychology and physiology closer together. Elsewhere Lamarckism is described as one of the most fruitful errors of science and, like phrenology, must be judged by its fruits.

Lewes, Spencer and Hughlings Jackson explicitly rejected phrenology and, though Bain wrote a book on the subject and tried to retain musical ability and a few categories of his own, phrenology makes no appearance in his *Senses and the Intellect*. The most interesting problem is the relation of phrenology to Lewes, Spencer and Hughlings Jackson. Lewes was shrewd, and the quotation from him used by Ferrier—"Indeed every discovery is a verified hypothesis, and there is no discovery until verification has been gained, up to this point it was a guess which might have been erroneous"—might serve as a suitable epitaph for phrenology.

The relations between Spencer and Hughlings Jackson, as Dr. Young would say, deserve an extended study. Sir Peter Medawar has recently spoken with respect of Herbert Spencer's work in general, while ridiculing each particular opinion in turn. Spencer's generalization about life being "the continuous adaptation of internal relations to external relations" may indeed have been a masterstroke in that, in spite of its nebulosity, it insisted that mind must be studied in relation to the environment and not in theoretical isolation. So far as the body is concerned, in comparison with Claude Bernard's almost contemporary remark that "La fixité du milieu interne est la condition de la vie libre", it is beneath contempt. His most disastrous influence perhaps was on Hughlings Jackson. When one reads Hughlings Jackson's early case-reports rightly praised for their brevity and vivid clinical observations one finds interpretations of the data which make one wince:

> Although the face, arm and leg are *each* represented in *every* part of the corpus striatum and optic thalamus, the muscles concerned in the most elaborate operations will be I suppose those most largely represented *throughout* the centres.

This is an idea directly derived from Spencer and totally without experimental support. Nevertheless, Hughlings Jackson's rather confident remarks on what must occur in the brain formed the core of the tradition of the National Hospital at Queen Square for eighty years, a tradition beyond question and above all need for verification.

Dr. Young does not bring out clearly Hughlings Jackson's real contribution to the understanding of cerebral localization. This was the observation in 1863 of "march" in those relatively rare convulsions which begin in the thumb, for example, and spread up the arm to the face and down the leg. This orderly and indeed constant spread in any one individual of convulsions strongly suggested a spatially localized motor system over which a wave of convulsive activity can spread. This is a concept of localization but it has nothing whatever to do with Gall. Fritsch and Hitzig and Ferrier, who provided exact experimental proof of the motor area in the dog and the monkey, do not mention Gall and it is difficult to see why they should.

It is arguable that Dr. Young does not emphasize sufficiently the steady stream of facts which strongly supported cerebral localization but had nothing to do with phrenology. These came from neuroanatomy and clinical observation, and to a lesser extent from early physiological experiment. The facts of neuroanatomy always pointed to localization. The existence of the white line in the occipital cortex only and the visual radiations described by Gratiolet suggest that the posterior part of the brain is different from the rest. The existence of contralateral paralysis in a single limb from a cerebrovascular accident was well known. In the 1860s there was Broca's localization of his speech centre, conclusive in spite of various shortcomings. Dr. Young omits all mention of the work of Marshall Hall who in 1835-45 established the reflex function of the grey matter of the spinal cord, a structure previously believed to be merely a conducting bundle between brain and spinal nerves. If one area of grey matter had a simple definable function, other areas of grey matter in the cerebral cortex could also have their own specific function.

From the time of Ferrier on it has been known that there are large areas of brain devoted to small parts of the body. The thumb and the lips have a large representation in the sensory cortex, each far larger than that devoted to the whole of the trunk. The central 9 degrees of the retina are represented on half the visual cortex, though this forms one-hundreth of the total visual field. The fovea itself, the central 1 degree, has an even more disproportionate representation. In the immediately surrounding cortex, which is now known to be concerned with the detailed analysis of pattern, the fovea has a representation which is disproportionately larger still. This is the only sense in which there is a neophrenology, and it does not use Gall's categories.

The analysis and recognition of visual patterns is not one of Gall's faculties, but it seems to be the primary function of the posterior third of the brain. Now that we know how very difficult it is to make a machine which can recognize patterns in any writing less stereotyped than the figures on our cheque-books, we are prepared to find large parts of the cortex concerned with this, an intellectual effort unrecognized in the early nineteenth century.

There have been many attempts to provide wiring diagrams of nerve cells and their processes which with appropriate assumptions could act as logical machines. When we have some idea of the mechanism of memory—at present totally lacking—we could start to complicate such models with probable inputs and outputs. We could then start looking for localized or indeed widespread mechanisms for logical thinking.

We are still a long way from providing a physical basis for "sentiment religieux" or philoprogenitiveness, but if we regard the brain as a problem-solving machine—orderly, microminiatured, analysable ultimately into terms of nerve impulses—we are likely to make progress towards some understanding of it in relation to characteristically human behaviour. On these lines there is still scope for work—and for wonder.

Dr. Young suggests that a knowledge of earlier attempts to provide suitable categories for study of brain and behaviour will help us with our present inadequacies. This seems to be running away from the difficulties of our present intractable but reasonably rigorously defined knowledge, to contemplate concepts arbitrarily chosen, easy to play with, but buttressed by special pleading and anecdotage, concepts which whenever they could be tested were found wanting. It seems a curious taste.

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Towards a hermeneutics of Oxfordism?

GERARD RADNITZKY:
Contemporary Schools of Metascience
200pp. Göteborg: Akademiförlaget, distributed by Eurospan, 44 Hatton Garden, E.C.1. £5 5s.

Judged from a British standpoint, this book is highly unsatisfactory. It consists of two volumes bound together, but separately indexed and paginated: "Anglo-Saxon Schools of Metascience" and "Continental Schools of Metascience". "Anglo-Saxon", for the author, means "logical empiricist, deriving more or less directly from the Vienna Circle": thus Neurath, Reichenbach, Hempel, are all treated as Anglo-Saxon philosophers (Karl Popper, by contrast, counts as a Continental, and is discussed in Volume Two). There is indeed an Anglo-Saxon phenomenon discussed called "Oxfordism" or O.L. ("ordinary languagism"); every intellectual trend here mentioned is either provided with an acronym, or designated as an "-ism", or both.

Gilbert Ryle is given no place in this Oxfordism: J. L. Austin is just mentioned in passing; G. E. Moore is assigned to this region; the chief exponents of the movement are said to be Wittgenstein and Peter Winch. As for the great tradition of Cambridge philosophy—this is wiped clean off the intellectual slate. Russell and Whitehead's *Principia Mathematica* is assumed, of course; but the whole Cambridge-based progression of thought—starting from Sidgwick and Ward, which passed through Russell and Whitehead, Moore and Broad, Wittgenstein and John Wisdom, Ramsey and Braithwaite—not to mention A. M. Turing and the "Turing machine", the implementation of which in digital-computers is changing our whole culture—all this achievement, for this author, just did not occur.

More seriously still, for a book specializing (in Volume Two) in a philosophy of history, Collingwood and his work is never discussed and in a 100-page discussion of the sociology of science, T. S. Kuhn, whose work is progressively transforming it, never figures at all (though he occurs in the index of the first volume). There are a whole host of misprints and further omissions.

As for the style, let us take a random example: "At this *hermeneutic level* or phase the analyst may achieve *Verstehen* directly, i.e., it is attainable by the good-reason-assay utilizing the aforesaid prenotions."

So: this Swedish philosophy of science survey is highly open to British criticism. But is this the end of the matter? What is this book fundamentally trying to say about the state of contemporary philosophy of science?

This question raises some disturbing doubts, for contemporary philosophy of science—that study cardinal to our culture—is, in the English-speaking countries, in an infertile and confused state. Current philosophies of history and of sociology, moreover, are weak: no groups who are actually making history ever read them. So the question which is indeed being asked by this University of Göteborg group of thinkers, in their recently founded Department of Metascience, cannot be prima facie ignored. This question is: granted the general failure of the Logical Empiricist tradition to produce either a practically useful philosophy of natural science, or a tyranny-dissolvent philosophy of history, or a deep or illuminating philosophy of sociology, can we, working not from within their tradition but within the "hermeneutic" Continental tradition, do any better?

Those in Europe who have been confronted by either Eastern European Marxism, or Hitler's Germany, will wish to ask, with a peculiar urgency: How, by learning to understand the recent historical process, can we get ourselves into a position where we can refrain from repeating it? But, given the increasing evidence that the whole affluent, technologically-developed world is moving, with steadily accelerating pace, into a new Dark Age, can any of us, of any nation, afford to leave this question unasked?

After considerable self-torture, though, British readers are still likely to conclude that this book does not make any great contribution to the problem. There are two novelties. The first is the five-fold division of types of philosophy of science, all of which are to be included under the new metascience, and each of which has a wider perspective than the last: the second is the notion of a "hermeneutic circle".

The philosophy of science subdivides as follows:

[(O) study of particular products, techniques, research results:]

(A) generalizations, of various sorts, of the structures and purposes of these:

(B) genetic study, both logical and sociological, of the growth of some science, or of science itself: "How does scientific knowledge grow?"

(C) sociological and psychological study of scientists-cum-their-sciences, yielding the new discipline of the "science of science".

(D) interactive study of the aggregate science-society-man "as a total system which sets its own aims and can change these aims . . ."

(E) the ultimate [mystical? metaphysical?] "meaning" of science, together with the ethical evaluation of science.

[(F)] (The Göteborg approach)—(horribly called in these volumes *P*, for "participant"), and deriving from (B) above, which asks the question "How can metascience be used to facilitate the actual process of doing science?"

It is the answer given to this last very reasonable question which chills. For *P*-metascientists are not actually going to do any science—to be around in the rough places, and in the awkward situations and really help: no, they are going to be eternal catalysers, preachers, advisers, and surveyors—in short, continually operational philosophic management consultants. This is just what the already overworked working scientist currently fears most; and this is why (rightly, on this *P*-analysis) he is determined to keep them out of his laboratory at all costs.

The second conceptual novelty for English-speakers is that of the "hermeneutic circle" (cycle ?). The word "hermeneutic" (from the Greek word for "interpreter") has been taken here from the discipline of biblical criticism—in which biblical texts, which were already in one sense "known", still have in another sense to be "interpreted". Moreover, in this interaction (or "tacking process") between an already possessed hunch, or some other form of pre-knowledge, and the increased knowledge which the new scientific study of this pre-known field gives, each side, in a reiterative process, affects the Even in the natural science, already known, and the by which scientific worker, to know it, itself affects the tion of what is still to be kn the social sciences (as in psy lysis), in a very direct and quial way, the investigator "insight" given by his theo indeed, for better or worse, the very social system which analysed, or the individual being who is being "cured". science, on this analysis, is tive and differentiative: never be any single orienta system, and therefore nev total "unified science".

All this is true: it is a warning: but what then? h just where we need to go do the detail, to reveal the wor really happening in science general, to pluck up our coura

But no: in this book what w gressively get is a more and cloudy and abstract "-isms": for instance Popper's icalism indeed contrasted with ricism, but modified by exist ism. This meta-meta-comp "-ism"-analysis will never fully confront any Moreover the Heidegger philosophic existentialism war Germany was notoriously, to the National Socialism; it was the derground communists, the vah's Witnesses, Bonhoeffer other such who resisted it. both counts, both as particip as agent of social metascience, as here expounded, veals itself as inadequate, altho it is its declared aim to among other things, with policy.

The problem, however, rem

Commentary

Our bricks-and-mortar universities will no doubt continue stoutly to resist transformation into batteries for some egghead marketing board; but can the same be hoped for a deliberately ethereal structure like the Open University, *née* University of the Air, established and financed by the State in an age of rampant economicism? A small item in a new handout from the University looks like evidence of a board-room logic which could easily re-ignite Dr. Leavis's as well as other, less inflammable sensibilities. This is a paragraph which reads, for all the world as if a mile of motorway were being contracted for instead of the instruments of learning: "We do not intend to have an exclusive arrangement with a single publisher. All of these books were put out to tender among publishers and in each case Macmillan submitted the best offer."

The books which Macmillan, a firm traditionally sensitive to the winds of change in educational publishing, will produce are three prescribed texts for students taking the Open University's foundation courses. They all fall, or some might say, thud, into that depressing but mushrooming category of textbooks known as "Readers". The titles are: *Understanding Society, readings in the social sciences*; *Industrialisation and Culture 1830-1914*; and *Socrates, a source book.*

Each volume has a captive market estimated at 8,000 to be going on with, provided the 24,000 subscribers who have so far applied for an Open University education go through with it when the courses start next January. They will certainly not be able to plead the cost of the books prescribed for them as a reason for dropping out, for, as the Open University's own handout brags: "'Understanding Society' which has 350,000 words is very good value at fourteen shillings." It is indeed, if there is any meaning at all in fixing the value of an academic work by aggregating the assorted words it contains. In these *Which?* terms, *Socrates* emerges as a good buy too, at 384 pages for 7s. 6d., while *Industrialisation and Culture* is better still: 368 pages plus pictures for six bob.

These are plumper tomes by far than you could get for the money in any other paperback series. But is there not something patronizing about this policy, if that is what it is, of offering Open University students what look like special terms on their textbooks? It would be more flattering to suppose them ready to spend more on books than other people, not less, and to be inquisitive enough to resent the idea of the compulsory background to their first year's studies being crammed into one bumper Reader. Readers, indeed, are a mode of book-making which it is particularly sad to see being sanctified by any organ of higher education; a high percentage of them have no justification beyond that of the drab philosophy which decrees that students should not be allowed to waste their time pursuing and assembling primary sources for themselves.

* * *

After the pressure-cooking of an Open University it is soothing to sink back into the more languorous life-style of a Closed one. It would be peculiarly tasteless to try and import the vocabulary or priorities of the new managerial millennialism into Oxford, where the University continues to examine its own affairs, and even its own business affairs, for free, without patronizing any glossy firms of consultants. One recommendation made in 1966 by that noteworthy tribunal of self-criticism, the Franks Commission, was that the University should reformulate its relationship with the Oxford University Press, which has far outgrown the old statutes regulating its constitution and has also been branded in Oxford itself as being unduly secretive about its operations.

Thus in 1967 the Waldock Committee was set up to make sure that the O.U.P. hadn't declined so far into commercialism that the good name of the University was being soiled and to see whether it couldn't be brought back into a more intimate relationship with Oxford and the University. The Committee's Report is published today as a supplement to the Oxford *University Gazette* (184pp, 20s.) and its 333 patient and instructive paragraphs make up a very worthwhile document of commercial history, plotting as they do the growth of the O.U.P. and the way in which its management has evolved since it supplemented its specialized publishing in Oxford with more general publishing in London and elsewhere.

Apart from H.M.S.O., the O.U.P. is now the largest publisher in the country and a considerable power internationally. It publishes getting on for 900 new titles a year under its own imprint, as well as a further 600-700 originally published by other university presses. More crucially, it has about 17,000 titles in stock, an average turnover for the period 1964-68 of nearly £17m. and a profit on this of £1,250,000.

One of the issues facing the Waldock Committee was, naturally, whether some of this profit should not be handed over to the University rather than retained in the Press itself. Oxford has one monument, the Clarendon Building, which testifies to the early acumen of the University's publishers, since it was largely built with the profits from the *History of the Great Rebellion*, and there are no doubt diehards still hoping to see contemporary landmarks subsidized by best-sellers; an Opie playground for dons' children perhaps, or a Concise Oxford Wing for the Bodleian. But the Report is against any statutory tax on the Press by the University, in the belief to distribute its profits inste merely making them would the O.U.P. into a less enterprise altogether.

In general, the Report the way in which the Pre been managed and its recom tions for change are humb One to be singled out in this cular issue of the *TLS* is improvement in scientific which has been stunted shortage of science editors the O.U.P. and has lagged the standards of publish other fields. Nor have the been very fully represented Delegacy, the scholars decree (or often simply which manuscripts deserve University's imprint: a intriguing Appendix to the shows the composition of the gacy broken down into since 1920. The Report that the Delegates functio sectarian bias and are as spokesmen for their ties; nevertheless, the rec dation is for more and mo Delegates, as well as for official liaison between editors of the O.U.P. and sity faculties. And Delega not be allowed, if the is approved, to go on as a self-perpetuating geront two six-year stints with a one year in the middle is posed maximum in mo though the retiring age is co maintained at 75.

The Waldock Report thorough and so well organ it is much more than a read for rival publishers measure their own metho those of the O.U.P. It is well worth one pound beca been printed, like other versity publications, for O.U.P. apparently lost ab on the Franks Report but be harsh indeed if it cost much to publish an inquiry own operations.

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Storage and retrieval of scientific information

BY D. J. URQUHART

RESULTS of scientific re- earch and development activi- es are visibly changing the we live in. We all depend upon continuation of this process to ove the material standard of and provide the extra re- necessary for the develop- of other intellectual activities. this process is understood by and, to put off those who might terested, we conceal one of the ial features of the process terms such as "the storage retrieval of information". How Yet the future well-being of of us depends a great deal the efficiency of the process. cience is concerned with the standing of the behaviour of and using this understanding interests of mankind. Each step we take along this path, ther inspired by idle curiosity or practical motivation, may pro- information which will revolu- e our lives.

process is haphazard, for no an tell where a discovery may Few among the growing army ntific workers have the same ctual stature as Faraday, yet day, when he was asked what the use of electricity, could ask in reply "what is the use ew-born baby?"

mation about the behaviour ure is acquired in a piecemeal For instance, a method of ing penicillin was known long its antibiotic qualities were eciated. To picture the prob- of the storage and retrieval ss, you might imagine an army ls, some of whom were con- d with making jigsaw pieces ders who were concerned in to find a group of pieces happened to fit together.

e physical storage problem is clear to librarians. For instance are in hand to double the ge capacity of the National ng Library for Science and ology—the N.L.L. This devel- is not because the library is ing any appreciable volume older literature. It is because the ut of scientific literature in the fifteen years is likely to equal revious output in the whole y of mankind. This phenome- the rapid expansion of scien- activity—is nowadays spoken the "scientific explosion"—a which has only recently e fashionable. However, this ion is not a modern phenome- The output of scientific litera- has been approximately dou- every fifteen years since 1665 the Royal Society started to the *Philosophical Transac-* then that event was not the You can confirm this by into the early history of the Society, which was founded The discussions which led the creation of the Royal went on apparently unhin- by the political upheavals of The Civil War, the execu- Charles I, the Common- and the Restoration appear made little difference. The Society itself was a product scientific explosion. As in explosions, some of the prod came the fuel which main- amplify them.

t the total volume of scien- rature was so small that as no storage and retrieval Each of the scientists of could have stored in his most of the scientific works interest to him. Newton in could, and probably did, of the available scientific This is no longer possible. the N.L.L. received about separate items containing more than one million perhaps fifty languages. the N.L.L. will almost receive another million No private mansion in would be able to date all this material. No could possibly read every- would have the gravest selecting the small frac- material which was of interest to him. This gives of the storage and problem.

problem is twofold, as far as the individual reader is concerned: he has to specify which handful of items from the millions available he would like to see; and he then has to obtain them. For the past three centuries mankind has been groping to find solutions to these problems, but always the solutions adopted have rapidly become inadequate as the magnitude of the problems increased. On the physical storage side, for instance, the impossibility of the individual having at home all the books he might need led to the creation of libraries in societies, institutions and clubs. Some of these have now ceased to exist or they have become parts of larger libraries.

Fifty years ago, the libraries of learned societies and professional institutions had, as a rule, fairly comprehensive collections of publications within their subject fields. Now this is exceptional. The reasons are threefold: first, the enormous expansion of the output of scientific literature; second, the boundaries between different subject fields have become more difficult to define; and third, the changes which have taken place in the library system and in the attitudes to libraries. It is only in recent years that we have begun to be conscious of the rate of increase in the output of publications. The other changes have been so gradual that they have hardly been noticed.

The retrieval problem has also been growing in intensity. About 100 years ago there were about 1,000 current scientific periodicals. To appreciate how little scientific literature there was then, one should know that in 1864 the Royal Society could contemplate making a catalogue of all the scientific literature published between 1800 and 1863. This catalogue was published between 1867 and 1872 and eventually it was extended to cover all the scientific literature of the nineteenth century. However by 1864 other attempts had been made to meet the increasing difficulties of finding particular items in the literature. In Germany, about 1830, the *Pharmaceutisches Central-Blatt* began to appear, and in this country the Chemical Society started including abstracts in its publications in 1841. In 1832 the Royal Society published a new periodical, *The Proceedings*, to carry abstracts of papers in the *Philosophical Transactions*; but before long this idea had lapsed and *The Proceedings* then became a separate set of original papers.

Today there are more than 2,000 periodical publications devoted to abstracts and indexes of scientific literature. More periodicals are now concerned with this activity than the total number of scientific periodicals which existed 100 years ago. Inevitably the magnitude of the task of providing guides to scientific literature is increasing. A simple measure of the rate of increase of the output of scientific literature can be obtained by looking at the *Royal Society Catalogue of Scientific Literature*. This eventually covered all the scientific literature in all subject fields of the nineteenth century. It occupies about the same shelf-space as last year's output of *Chemical Abstracts*, which relates to one year's output in chemistry alone.

The physical problem of preparing abstracts and indexes to published literature has increased with the volume of the literature, and efforts are being made to use computers to simplify this task. An interesting development with exciting future possibilities is the *Index Medicus* which is published by the National Library of Medicine in the United States. This index consists, under a controlled list of subject headings, of references to the papers which relate to particular subject headings. It is now printed with the assistance of a computer. The input includes a reference to a scientific paper and its index headings and these are rearranged by the computer so that they appear under all the index headings concerned. The computer in this instance was used to assist the mechanical compilation of the index and its printing, but it provides an interesting by-product—some retrieval tapes. The National Library of Medicine now makes available computer tapes which include the references and index entries added to *Index Medicus*. These computer tapes can be searched for articles which relate to some particular combination of subject headings.

Of course, the approach made by *Index Medicus* to providing a guide to available literature is only a first step. It involves human beings in deciding what index headings to use. A further stage in the development would be to develop the use of computers so that they could recognize the appropriate index headings. Efforts to develop indexing systems using this idea are now being actively pursued. One of the main obstacles here is the cost of putting text into a machine-readable form. The compatibility of the systems of data handling used in printing machines and in computers would assist this process. The use of indexes presupposes that a scientist knows and can specify what he is looking for. But part of the retrieval process arises because some of the potential users do not know what sort of information they want. Indeed, part of the problem is, not so much answering specific questions, but stimulating the right sort of questions. To trigger off the essential questions, scientists do many different things. Some of them browse or scan through the recent issues of some periodicals.

To assist this scanning activity, some special services now exist. Some of these are simply reprints of the current contents lists of a group of periodicals. Others are more sophisticated and are basically lists of recent articles in particular subject fields. These lists, with the aid of computers, can now be tailor-made to meet an individual's needs. This activity is known as S.D.I.—the Selective Dissemination of Information.

What of the future? Unless the folly of mankind terminates civilized life on this planet, the volume of the intellectual output will continue to increase for some appreciable time to come. It is true that in this country, as in other developed countries, some people are beginning to ask whether there are some visible limits to the output of the intellectually creative. However this may be, it is clear that the intellectual output of the less developed three-quarters of the earth can and will be increased considerably. The scientific explosion—unless it causes man to destroy himself—will thus continue to increase the output of publications, and the end of this increase is not yet in sight.

How to decide which specific items to read is going to become more difficult as the mountains of publications grow higher. The guides to publications are going to become more numerous and more complex and this development is going to be aided by an increased use of computers.

This growing complexity is making it more urgent for the educational system to abandon one of its historical tenets—that every educated person knows how to use a library. Even if this were once true, it is certainly no longer true.

Some years ago, the N.L.L. organized as an experiment some

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informal courses for research students, each lasting two to three weeks. What we tried to do was to give the students an introduction to the structure of scientific literature, some guidance on how to use it, and an opportunity to do a literature search using the N.L.L.'s resources. We found that most of the research students had been given the idea that probably all worthwhile references were already known to their supervisors and they thought the course would be a rest cure.

We found that the research students were staggered by the sheer volume of scientific literature. Biologists were surprised when we introduced them to *Chemical Abstracts* and even more surprised when they found something useful in it. Each student went away with something useful on the subject of his thesis, but a few realized as they left the library that they would have to change the emphasis of their theses if they wanted to do something original. Indeed it was so easy in the N.L.L. to find sizeable documents unknown to the research students' supervisors that I wondered whether I should advertise a new service: "Your Ph.D. thesis provided in plain covers. Write in confidence to the N.L.L. All fees refunded if the thesis is not accepted." Instead I adopted a more difficult target and tried to persuade universities and colleges that they should give more attention to the problem of training students to use libraries and information systems.

This training must not be treated as some optional extra which is added to an already overloaded syllabus. For most of what is now taught in our colleges and universities is likely to be out of date or superseded long before the majority of the existing students retire. What they need to know more than anything else is how to keep themselves up to date.

Such knowledge will need to be continuously updated as methods change. So students must be conditioned to this need. They should understand more clearly than they understand anything else that the new scientific knowledge of the next fifteen years is likely to be equal in volume to all the knowledge which has so far been acquired in the whole history of mankind.

Libraries clearly must take an active part in this training process. To be effective, they must change the popular image of learned libraries as storehouses and museums for books. To do this, libraries must not merely catch up with the developments of the industrial revolution, they must also seek to apply the technologies of the scientific revolution. This will necessitate far more scientists and technologists in our libraries and information systems, and these must not merely be those who are of little use in the laboratory or the factory. For, as the mountains of the records of man's achievements grow higher, it is going to be easier to add to these piles than to decide what to do with them.

Farewell to the compositor

From James Moran

On June 28, 1968, I sat in the Brooklyn office of Wolfgang Grube, chief engineer of the Mergenthaler Linotype company, and listened, fascinated, as he outlined the development of an optical character recognition device which could read any typewritten or printed matter. Combined with a computerized filmsetter, this would lead to the composition of books without human intervention after the author's copy had been typed.

I communicated this advice to *TLS* readers in an article entitled "Justifying the Printer" on August 15, 1968, and predicted that the O.C.R. device would be ready by the end of 1969. Not only was it ready, but the first product is now available. V. C. Clinton-Baddeley, a British thriller writer, enters the halls of technological fame by being the first author to have a book composed entirely by machines, rather than by men utilizing machines.

An unmarked copy of the previously published (1967) British edition of *Death's Bright Dart* was "read" directly by a Mergenthaler prototype O.C.R. system, and then the text was converted into digital, electronic impulses for computer "input" by this new O.C.R. system, the first to be capable of reading text composed in characters not specially designed for the benefit of the system. The author's words were then transformed into a completely new typographical style, with American spelling and punctuation by an I.B.M. 360 computer, and film-setting was performed at a speed of 1,000 characters per second by the Linotron 1010, an advanced photocomposition system developed by Mergenthaler Linotype and C.B.S. Laboratories, a division of the Columbia Broadcasting System.

The book, published by William Morrow & Co., Inc., of New York, is very legible and readable, due particularly to the generous "leading" between the lines. It is true that this first experiment has been made on a printed text, but there is no bar now to the composition of books direct from typed manuscripts. I was cautious in my 1968 article, not wishing to suggest a wholesale change-over to this new technique, and I continue to be cautious. The average short-run novel is not the Bible or an encyclopedia and does not need to be set at the rate of 1,000 characters per second. Moreover, the Mergenthaler O.C.R. is a prototype and has to be developed and marketed. Each book printer will have to consider the cost, and I see no reason to alter my 1968 view that orthodox methods of composition will continue to be used as long as they prove to be economic.

Nevertheless, the end of the keyboard compositor is predictable. I repeat my 1968 warning: Don't put your son in the composing room, Mr. Worthington; let him learn computer programming instead. Or, better still, let him write thrillers. Clinton-Baddeley is not a computer.

No longer than a shortish review in this journal, but elegantly printed by the Stellar Press, Brian Gould's *Buying a Square Piano* (8 unnumbered pages, Naples Press, Bedford Park, London, W.4, 10s.) offers advice to prospective buyers of square pianos. It makes a somewhat unusual private publication and is limited to 100 copies. The grammar of the last sentence is shaky.

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من الأصل

The Shuckburgh Gutenberg

From a Correspondent

"Pray ponder a moment to fully appreciate the rarity and importance of this precious consignment from the Old to the New World. It is not only the first *Bible*, but is a fine copy of the *First Book ever printed*. It was read in Europe nearly half a century before America was discovered." So wrote Henry Stevens of Vermont, the great London-based bookseller, when he dispatched on February 10, 1873, for George Brinley, the great Hertford book-collector, one of the earliest copies of the Gutenberg Bible to cross the Atlantic (James Lenox of New York was ahead of him in 1847, at the "mad price" of £500). The last copy to make the same journey on January 26, 1951, was probably the first to make it by air (strapped to the wrist of its escort): a journey which had its eventful, if slightly ridiculous, moments. The Erfurt -- Albert Cohen — Stevens —Brinley—Hamilton Cole—Brayton Ives—James H. Ellsworth—Rosenbach—John H. Scheide copy of the first and noblest of all printed books is now in the library of Mr. William Scheide, of Princeton, New Jersey.

Dr. Martin Bodmer, of Grand Cologny, Geneva, owns the Rottenbuch/Bayerische Staatsbibliothek copy, sold as a duplicate in 1858 to the Imperial Library of St. Petersburg, re-sold by the Soviet Government to Maggs Bros. of London in 1931. With one exception, all the other recorded copies (forty-six reasonably complete) are in institutional libraries: in Germany and elsewhere on the Continent, thirteen in the United States, and seven in this country—the British Museum, both on vellum and on paper, Edinburgh, Bodley, Cambridge, Rylands, Eton College. The solitary exception is the airborne copy, and this, as reported in a front-page article in *The New York Times* of April 14, was recently purchased by Mr. Hans P. Kraus, the well-known New York (and Liechtenstein) bookseller and publisher, from Mr. Arthur A. Houghton, Jr., the well-known New York book-collector, who is also president of Steuben Glass and past-president of the Metropolitan Museum of Art.

The purchase price, naturally, was not disclosed: but it must presumably have been not wholly inconsistent with the price-tag that Mr. Kraus has now publicly affixed to it, i.e., $2,500,000-$2,750,000 (can haggling be expected? It would be almost sacrilege). Mr. Kraus, who is a collector as well as a bookseller, shares with the late Mr. Rosenbach an innate conviction that the great books, the great manuscripts, are things of glory beyond any mere commercial arithmetic: as a certain American connoisseur of pictures was heard to say, a dozen years ago: "you stand in front of *that* for five minutes, and what is money?" And the humblest book-collector, as he noses up and down the Charing Cross Road or the Paris *quais*, will surely not withhold his applause for the lordly confidence of the first man in the history of bibliophily to price a printed book at more than a million pounds.

Mr. Kraus's Gutenberg has a romantic history. Its earliest known owner (his bookplate is in both volumes) was Sir George Shuckburgh-Evelyn, Bt., F.R.S., a book collector in the Roxburghe style who having perhaps bought it on the Grand Tour, had it stylishly rebound in 1789 by Henry Walther, one of the German craftsmen working in London, much patronized by such connoisseurs as Anthony Morris Storer. In 1824 Thomas Frognall Dibdin, the accredited rhapsode of that grand school of collectors, mentioned its reputed existence—no more, for he had never seen it and Sir George was then twenty years dead--in an uncommunicative footnote in the second volume of his *Library Companion*. Thereafter, for a century and a quarter, it vanished totally from bibliographical or bibliophilic ken; monotonously listed among *exemplaires disparus* by census-makers De Ricci (1911), Schwenke (1923), Reichner (1927), Johnson (1932) and Lazare (1950): unknown to Dziatzko and Aloys Ruppel: its memory ever more ghostly, as a mere reference to the by then somewhat discredited Dibdin.

Meanwhile, as subsequently transpired, the Shuckburgh Gutenberg had passed, always indirectly in the female line (so that *Debrett* was hardly more helpful than De Ricci), through a succession of such aristocratic families as Liverpool, Fitzwilliam, Portman, Dawson-Damer, to a quiet country house in Dorset. It is true that many a fine book has stood for generations on the shelves of stately home or country mansion without the necessity for making any vulgar public appearance, whether on exhibition or in the auction room; but not many of such grandeur as this have lain *perdu* for so long.

In January, 1951, however, the klieg lights were suddenly switched on. Purchased by private treaty from the late Lady Christian Martin by Scribners of New York, through their London agency (operating initially arm-in-arm with Messrs. Quaritch), the Shuckburgh Gutenberg made a dramatic reappearance on the front pages of the New York newspapers, and shortly thereafter was included in the Scribner Rare Book Department's catalogue no. 137 "Fifty distinguished books and manuscripts": the only item therein to which no price was attached, and the first time in the history of book-collecting that a Gutenberg been offered in a booksel distinct from an auctioneer's logue. It was bought from by Mr. Arthur Houghton, listed as No. 43 in Mr. Lazare's revised census of a note that of the five missing (out of 641) two had since plied from a seriously volume two (once in the Library of Trier) which was in Mr. Houghton's collection.

Those who relish the by-ways back-stairs of book-collecting consult two first-hand sources some account of the Shuck Gutenberg's transit between Christian and Mr. Houghton, earlier is "Operation Shuck in John Carter's *Books and collectors*, in which its and transport to New York cribed with what the prota called "a perhaps unseemly More recently, Professor Da Randall of the Lilly Library, 1951 represented the New York of the Scribner axis, devoted subsequent proceedings a chapter in his entertaining of reminiscences, *Dukedom Enough* (New York: Ra House, 1969): a narrative in he discloses that the original was provided by Sir Sydney Co ell, that Lady Christian's pric £40,000 (a stiff one for those days—the previous highest Gutenberg was $106,000, in and that the book's cost Houghton (allowing for the fragment taken by Scribners change and subsequently broke was something in excess of $30 Statisticians, investment cons and students of *The Times-So* Index will note the 1,000 per plus increase represented by Kraus's asking price eighteen later.

Slightly curdled galaxy

HANS P. KRAUS:
Sir Francis Drake: A Pictorial Biography
236pp. Amsterdam: N. Israel. $80.

The present handsomely produced and beautifully illustrated volume calls back the days that are gone in more ways than its author may have intended. It is not so much the Tudor age that it evokes as the Edwardian. The air of affluence, of large libraries in country houses where roaring fires are kept up by the discreet ministrations of domestics, of bibliographical and scholarly machinery oiled and maintained in perfect working order so that the owner can set it chattering for his own delectation, is unmistakable and not without its charm, at least as a change from placards, duffle coats and "demos". Conceived in such terms a book of this kind requires no academic or commercial justification. A private collector, proud of his acquisitions, wishes to crown the labours of twelve strenuous years in the salerooms by a sumptuous illustrated and descriptive catalogue. If he wishes to link the objects in his possession with a biographical account of the man round whom they are centred. If he further commissions an historical introduction from two well-known specialists on sixteenth and seventeenth-century navigation, what business is it of anyone else?

None. Unless, as Mr. Kraus has done in this case, he offers the results for sale to the public and makes claims for them which must, by and large, be either accepted or rejected. It may seem ungracious to apply professional standards to the dilettante but it is difficult to see how else one can answer such questions as: For whom is this book written? What, exactly, does it purport to be? Its publisher, who can hardly be considered a hostile witness, thus describes it in his brochure:

> His [Drake's] life is here documented through manuscripts and printed books, maps and views, portraits and medals from the author's own collection: an unparalleled assemblage of original material achieved only by a lengthy and persistent quest. The success recorded in this book shows the extent to which Mr. Kraus, the noted New York bookman, had the courage and deter tion to seize opportunities which ably cannot be repeated.
>
> . . . Through his presentation of original sources in context with life story, Mr. Kraus truly life the events of history. The narrative, his choice of illustrations the scholarly catalogue of his co combine to form a history of Dr his times.

This seems to disclose some sion of mind between the history and the nature of source. Eggs are not the same as omelettes. And is there further confusion about who real hero of the story: holding his fire until he sees the of the auctioneer's eyes, or drumming the Dons up the

That Mr. Kraus has assem quite remarkable collection of scripts, maps, drawings, medals and paintings is able. That a large num them have been reproduced on good a well-printed and well book is evident. But to expect book so conceived should alchemy be transmuted into is to go back beyond the Tu the ages of faith. Archivists rians, connoisseurs and muse may very probably find in the much to interest and please but will they want to be bothe an undistinguished and historical biography?

As though uneasily aware work might be criticized short weight on the history Mr. Kraus has included an tion by Commander Waters Boulind which he describes great and important study of and his times". It is to that the descriptive entries catalogue are written in a and objective spirit. reader has the right to expect scholarly history he is given offerings as:

> At least in part this change response to the invitation Elizabethans came to feel to them by the lure of the

Is not this rather like paste to the sound of Gree

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ooks eceived

eology

MICHAEL (Editor). *Norfolk ology.* Volume XXXIV. IV. 337-454pp. The Norfolk Norwich Archaeological ty. 30s.

place in these transactions to a paper by the Norfolk and antiquary, R. W. Ketton-, who died last December. In transcribes and reflects upon correspondence between the Horatio Walpole, Sir Walpole's brother, and the Gurney, Quaker merchants. quarrel over sporting rights, acrimony was tempered only fact that the Gurneys were to Walpole as political sup-; and as Ketton-Cremer it shows what "a tangle and absurdities" the Laws were until their reform 1830s. The three following are reports on excavations. later ones include a brief of the Norwich Society of in the early years of the last

itecture

ANTHONY, *The Politics of* 219pp. The Archi- Press. £3 5s.

glance at the Weissenhof ex- of 1927 Professor Jackson in 139 pages of text and of illustration a history of " architecture in Britain Amersham 1930 to Cumber- 1967, lavishly supported by from contemporary pub- The title is rather a mis- for the politics are mostly Both the gaps and the particularly in the post- may provoke some dis- The somewhat humour- frequently reads like and neither captures the the period nor digs very Modern architecture is re- primarily as a stylistic move- and there is little suggestion social attitudes and methods and new types of pro- in a changing economy, have to new aspirations and It is disappointing that in the narrative of a living memories there could not with patience from secondary sources.

Aviation

Burrows, William E. *Richthofen.* 268pp. Rupert Hart-Davis. 36s.

The greatest popular figure on the German side in the First World War was the fighter pilot von Richthofen, who was neither a brilliant pilot nor a warm-hearted comrade. He might never have become a fighter pilot but for a chance meeting in a train with Boelcke after having started his service first as a cavalry officer and then as an observer in a bomber unit. Like Albert Ball on the British side, he was a fine shot and a dedicated hunter. He inherited Boelcke's technique and applied it both as an operator and in his management of the wing he made famous; his successes were won in the period when the allies suffered from inferiority in aircraft performance. Mr. Burrows paints a good portrait of the "red baron" and introduces some of the characters like Göring and Udet who were to take part in another drama a generation later.

Turner, Richard E. *Mustang Pilot.* 176pp. William Kimber. 30s.

The Mustang was the escort fighter which, with the help of drop tanks, could accompany the bomber aircraft of the U.S.A.F. on journeys lasting up to five hours in the last two years of the war and was remarkably successful in protecting its vulnerable charges. Lieutenant-Colonel Turner was one of the outstanding pilots and tactical commanders in a group equipped with Mustangs, and this is a chronological account of his ninety-seven missions during 1944. His story, like that of others who survived, puts in a strong light the value of vigilance and good shooting at close range. It provides a vivid picture of air combat conditions before the computer and homing rockets came to turn the fighter pilot into a skilled monitor.

Biography and Memoirs

Anderson, Verily. *Scrambled Egg for Christmas.* 156pp. Hodder and Stoughton. 25s.

Verily Anderson is a member of that vast tribe of Buxtons, Barclays and Gurneys whose strong family sense and many talents make them a perfect subject for social historians. She has written of her ancestors before, but in *Scrambled Egg for Christmas* Mrs. Anderson returns to the recent past, describing her day-to-day-life as sole prop and stay of five children, the three youngest under ten. The story opens with the recently widowed Mrs. Anderson vowing that nothing shall change the pattern of her Sussex farmhouse days; but kind friends shake her up and dust her down and soon the Andersons find themselves in smartest Kensington, in a converted stables belonging to her cousin Wayland Young. In fact, she has a splendid time and her children do all the right things like singing for the Queen and marrying suitable partners, so one feels she is a little ungracious about her poor friend Clare, billed as intolerably interfering and intrusive, but without whose call to action there would have been no material for a book. The egg in the title reminds one of Betty Macdonald's *The Egg and I*: Mrs. Anderson writes with much the same cheery good sense as that best-selling American lady.

Economics

Harrod, Roy. *Money.* 355pp. Macmillan. £3 5s. (Paperback, 35s.)

Sir Roy Harrod's expository gifts are well shown in this volume, which contains his lecture course "delivered in Oxford University for more than forty years", ranging from the forms and uses of money to the contemporary international problems of the U.S. dollar. Such arcana as funding, open-market operations, quantity theory, Euro-dollars, cost and/or demand inflation, and monetary management for full employment and/or growth are exhaustively but clearly explained. Economists will naturally most relish Harrod—Keynes's biographer and friend—on what Keynes meant and what he said. But this welcome book should get as many non-economist readers as students of economics; and even the latter will be struck by the author's width of historical and international vision in a subject which he makes lively and stimulating.

History

Blake, Robert. *Disraeli and Gladstone.* 35pp. Cambridge University Press. 6s.

The antipathy between Gladstone and Disraeli seems to have been deep and ineradicable. Each, as the Provost of Queen's College, Oxford, reminded the hearers of his Leslie Stephen lecture at Cambridge, could say scathing things about the other. Looking into the reasons for this mutual revulsion, he shows both those eminent Victorians in a somewhat new light. Disraeli he sees as a much less complicated character; Gladstone, contrary to popular belief, as the more cosmopolitan and cultivated, a better talker and better company at a party. The antipathy sprang from their whole approach to politics, their political style. For Disraeli politics were practical business, not concerned with religion and morality; to Gladstone, his rival was cynically amoral. It is a perceptive study of the characters of both men.

Finlayson, Geoffrey B. A. M. *England in the Eighteen Thirties.* 115pp. Edward Arnold. 24s. (Paperback, 12s.)

Mr. Finlayson says of his short book that it is not a comprehensive history of the 1830s but a commentary on them. It was a decade of reform, and of a shift of power: it saw the first Reform Act, the Municipal Corporations Act, and the establishment of the Ecclesiastical Commission. It saw too the relief of social conditions, in the factories and among the poor. The author reviews each development in turn, and finally another aspect—the disappointment with the reforms, manifested in Chartism and the Anti-Corn Law League. This little book is one of a series planned to introduce students to the foundations of the modern world, and it concludes with a book-list for a fuller study.

Kimball, Elisabeth G. (Editor). *Sessions of the Peace for Bedfordshire 1355-1359, 1363-1364.* 145pp. H.M.S.O. £3 5s.

The crimes and misdemeanours most common in Bedfordshire in the reign of Edward III, when pestilence and war were changing rural circumstances, are reflected in these records of the justices' sessions which survive in the Public Record Office. Assaults were the most common—ninety-nine of them in the period covered by the rolls. The twenty-three robberies were most often of horses; there were three abductions and the same number of armed attacks in the justices' presence. Moreover, the fourteenth century had its prices and incomes difficulties—two cases of overcharging, and two of taking excess wages. Evictions, too—a prior who had turned out tenants pleaded successfully that the rent was in arrears. With the fully transcribed Latin entries are summaries in English.

London

Ashford, E. Bright. *Tyburn Village and Stratford Place.* 20pp. The St. Marylebone Society. 7s. 6d.

Here is Tyburn without the Tree: the sinister implications of the name cast no shadow over this essay in London topography which traces the course of the Tyburn river as it flows southward, beneath Oxford Street and past Buckingham Palace, to form Thorney Island on which stands the Abbey, and so to join the Thames. The river's contribution to the city's water supply, notable buildings on its banks such as the banqueting house used by former Lord Mayors, and the history of Stratford Place, to the north of Oxford Street, are some of the themes of this interesting contribution to the study of London's past. It is the tenth of the publications of the St. Marylebone Society.

Politics

Hill, Dilys M. *Participating in Local Affairs.* 237pp. Penguin. 6s.

Dr. Hill's Pelican invites us to believe that, notwithstanding present apathy, interest can be revived in local affairs if the present fashion for action groups or the lobby can be fostered. It is hard to believe it. Although the book is full of good points, most of the evidence adduced leads one in association with experience to the opposite conclusion. People on the whole do not, as Dr. Hill says, understand the complications of local government; nor do they wish to. Quite a few vote the party ticket, but when it comes to satisfying a need it is the official to whom they turn. (Even Dr. Hill does not think of the governors

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ing little work has the of bridging the gap librarians and computer and on the whole reasonable success. In case for machine-based libraries, Mr. Henley is to fall into the error of people, and issues a formal warning "against assuming that the same form of computer system will serve for all types of library". The analysis of library operations, using a systems approach, will help students to gain a clear idea of these operations themselves as well as of the relevance of computers to them, while the brief but simple explanation of programming fills a need that has become quite acute for the budding librarian with little mathematical expertise.

The final chapter, "The philosophy of a machine-based system", may also be recommended, for here again Mr. Henley does not imagine that the introduction of machines will solve all library problems if only librarians can be persuaded to relinquish their antiquarian attitudes. He emphasizes, for example, the difference between the usual scientific or technical inquiry, such as "What is the boiling point of mercury?", and the usual humanities inquiry, such as "What were the causes of the First World War?". Computers undoubtedly have much to offer to librarians and information officers, but their acceptance will only come easily if the computer specialists will pay sufficient attention to problems like these.

On the methods of librarianship, Mr. Henley is not so sound, although he shows a good deal of sympathy with the aims of librarians. His explanation of "recall" and of "facet analysis" do not square with what would be the usually accepted definitions, while his statement that "there is no reason why human knowledge should fit neatly into categories" betrays a certain philosophical innocence; if human knowledge cannot be fitted into categories, how do we know that it is knowledge? What is really meant, perhaps, is that a subject analysis representing a complex subject cannot be fitted into one single "correct" category, an interpretation that seems to be confirmed by the immediately following reference to the Dewey decimal system as "a good case in point". Modern tendencies in classification systems and thesaurus construction are to bring the two approaches closer together rather than to stress their differences, except in so far as each has its own characteristic contribution to offer in the retrieval process.

These are minor points, however; the book as a whole goes a good way towards providing an elementary introduction to the subject, and might well establish itself in spite of the high price.

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Reprints in the History of Science

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Price to 30 June £4.4 From 1 July £5.5
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Pre-publication £4 Published £5.5

CARPENTER, William B.: Nature and man: essays scientific and philosophical. 1888
AVAILABLE NOW. Price £8

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WALLACE, Alfred R.: The wonderful century, its successes and its failures. 1898
AVAILABLE NOW Price £5

History of science catalogue available on request
Please order from your bookseller or from
GREGG INTERNATIONAL PUBLISHERS LIMITED
FARNBOROUGH HAMPSHIRE ENGLAND
GREGG INTERNATIONAL

of the school as an alternative approach to the headmaster or an official.)

The truth seems to be that in an ever-increasing number of areas the old idea of community has ceased to exist. Because he has a car, has certain interests and habits, the man at No. 90 may have quite a different community area to his neighbour at No. 92. An action-group or a lobby may interest him for a specific purpose, but it is unlikely to be a prolonged attraction or the beginning of a change in his normal behaviour pattern. But the book has its appeal and is persuasive.

Ram, Mohan. *Indian Communism: Split within a Split.* 293pp. Delhi: Vikas Publications. Rs.27.50.

Anyone who doubts that communism is in essence a theology without a God might do worse than read this detailed and scholarly analysis of the vagaries of communist thinking in India. The importance attached to orthodoxy, the disputes about what orthodoxy really is and who upholds it, remind the historian vividly of the enormous theological controversies which racked the Byzantine Empire over the monophysite and other heresies. Differences in ideology and about tactics have been artificially complicated by the Sino-Soviet doctrinal and political split: but Mr. Mohan Ram argues pretty conclusively that what only later became known as Maoism was the inspiration of the dangerous revolt in Telagana which anticipated by a good many years the final triumph of the Chinese Communist Party. This movement was crushed—like the later Naxalpari revolt in West Benghal largely as a result of the moral support given to the Indian authorities by Moscow; but it left a legacy which is once again becoming important. Today in India there are two non-Maoist parties, the Communist Party of India (C.P.I.) and the Communist Party of India (Marxist) (C.P.I.(M)); opposing them are one Maoist party already formed—the Communist Party of India (Marxist-Leninist) (C.P.I. (M-L)) and one in process of formation. This last is the inheritor of the Andhra-Telangana rural revolutionary tradition. As might be expected, Moscow and Peking are taking different sides but these external influences are more the occasion for than the cause of the ideological and strategic divisions in the ranks of Indian Communism. This book is fascinating, if not always easy, reading.

Social Studies

Caplan, Lionel. *Land and Social Change in East Nepal.* 224pp. Routledge and Kegan Paul. £2 10s.

This is a detailed study of the relations between the Limbus and the immigrant Hindus in the four settlements of Angbun, Bharapa, Chitok and Dorumba situated in the district of Ilam in east Nepal. At first sight, these relations appear to follow the classical pattern of the penetration of tribal communities by immigrants higher in the cultural scale, with the concomitant alienation of land, economic depression, and reduced living standards. But the situation here is different; in the first place, alienation of land in the ordinary sense is only possible in the case of the *raikar* tenures governing lands originally granted by the Limbus to the immigrants; and while the usufruct of land under the traditional *kipat* tenure can be mortgaged, the land itself cannot change hands and can be redeemed at any time. Next, the Limbus now find economic opportunities in service abroad in "Gurkha" regiments and in increasing employment at home to accumulate funds to redeem *kipat* lands whose usufruct has been alienated, so that the process of economic depression in the original community can be halted. The upshot is that the relations between the Limbus and the Brahmans—the most influential and enterprising of the immigrants—are not static but dynamic, and the socio-economic tendencies thus revealed can be studied, as Dr. Caplan has done, in their present-day workings, and not as deductions from past happenings. This book exemplifies the admirable work which characterizes the Department of Anthropology of the London School of Oriental and African Studies under the guidance of Professors von Fürer-Haimendorf and Adrian Mayer.

Hewett, Sheila, with Newson, John and Elizabeth. *The Family and the Handicapped Child.* 240pp. Allen and Unwin. £2 15s.

This is a study in their homes of 180 children born in the East Midland area during 1957 who suffered from cerebral palsy. It is intended to be compared with the studies made by John and Elizabeth Newson of normal children in the Nottingham area, and to this end Mrs. Hewett has detailed the minutiae of daily life and family relationships as well as information specifically about the children's disabilities. The children described had handicaps ranging from mild physical ones to total mental and physical incapacity. There is no attempt to mask the bleakness of their situation, but the book will be an encouragement to parents of children afflicted in these ways in that it shows with what stoicism and resource most of the families cope. Although the material is mainly factual, as with the Newsons' Nottingham surveys its human content ensures that it is always interesting and in this case often moving, too.

Sports and Pastimes

Ball, E. and P. W., *Holiday Cruising on the Thames.* 149pp. Newton Abbot: David and Charles. £2 2s.

So much has been written about the Thames that another book on the subject must risk simply covering well documented facts and adding nothing new. This volume makes a more distinguished contribution, by giving, clearly and without unnecessary embellishment, a mass of facts and advice for the would-be holidaymaker (whether in his own or a hired craft).

Transport

Hadfield, Charles (Editor). *Canal Enthusiasts' Handbook, 1970-71.* 193pp. Newton Abbot: David and Charles. 35s.

Under the general editorship of Mr. Hadfield, Mr. McKnight, well known as a photographer of canalia, has edited the British Isles sectio handbook, and Mr. Edw the overseas section. The app in each section is different British Isles there is a grea detailed information, which valuable for anyone contem a canal holiday, or indeed one with anything more most transient interest in th waterways. The overseas deliberately less detailed, rather to give a general des of waterways and the acti them, to arouse people's inte

Travel and Topograph

Ward, Norrie. *Yorkshire* 134pp. Dent. 30s.

Book titles can sometimes a first impression that thi was concerned with some ground activity proved wid mark. It is in fact a ramble pany with a Yorkshireman proud of his county and harm in boasting of it. He fund of good Yorkshire sto that of the town council wh posing a reduction in tra met with protests because, complained, people would as much when they walked forsaking Yorkshire humou dialect, he turns to archa examining some of the prehistoric sites. He reflects claims of that Methuselah, Jenkins reputed to have 169; and on the abortive sc carrying a railway through dale here illustrated by a sketch of the Aysgarth Falls by a viaduct. The essence of shire is here, both gra comical.

VACANT APPOINTMENTS AND PUBLIC NOTICES &c

Librarians

ALBERTA, CANADA

PARKLAND REGIONAL LIBRARY situated in Central Alberta, midway between Calgary and Edmonton (two hours' drive) and on the foothills of the Rocky Mountains, urgently requires a DEPUTY LIBRARIAN.

35-hour week with no Saturday work. Pension and health plans, three weeks' paid holiday and eleven public holidays a year.

Starting salary not less than $7,200 (£2,800) a year according to experience.

If you are a male chartered librarian, able to drive, good at public relations and with two or more years' library experience, wanting a challenging, responsible, well-paid job with good promotion prospects, write air-mail immediately for further details and an application form to Librarian, Parkland Regional Library, Lacombe, Alberta, Canada.

COLLEGE OF ALL SAINTS

TOTTENHAM, N.17

LIBRARIAN, man or woman, required as Deputy to the Tutor-Librarian, to assist in the day-to-day work of the Library in this College of Education. Applicants should be Chartered Librarians or have passed the Library Association's Part II examination. Applications from students in Library schools completing their course in the summer of 1970 will also be considered. The appointment is available from 1st August or as soon thereafter as possible. Residential accommodation may be available for a single woman, if desired. Salary on the scale £1,149 to £1,634 (subject to review) plus London Allowance £90, with entry at the point appropriate to experience.

Further information may be obtained from the Principal, to whom applications (no forms), giving two referees, should be sent within two weeks of the appearance of the advertisement.

UNIVERSITY OF BRADFORD

APPOINTMENT OF MANAGEMENT CENTRE LIBRARIAN

APPLICATIONS are invited from candidates with appropriate qualifications and experience for the post of LIBRARIAN to be responsible for the operation of the Library at the Management Centre, and the development of bibliographical and information services.

Salary within the range for Assistant Librarian II (£1,240-£2,305 p.a. under review) with superannuation (F.S.S.U.). Removal allowances up to £150 payable in certain circumstances.

Application forms (returnable by 29th May, 1970) and further particulars obtainable from the Registrar, University of Bradford, Bradford 7, quoting ref: L/AL/51H.

BUCKINGHAMSHIRE EDUCATION COMMITTEE

COUNTY LIBRARY

APPLICATIONS are invited for the following newly established POST at the new Chesham Regional Library:—

SENIOR ASSISTANT (REFERENCE).

Salary: A.P.I. £1,345 to £1,575 per annum.

N.J.C. Conditions of Service. Successful candidate subject to medical examination. In approved cases the county council makes a grant towards removal expenses up to £100.

Applications (no forms), together with the names and addresses of two referees, to the County Librarian, County Library, Walton Street, Aylesbury, Bucks, by the 21st May, 1970, from whom further details may be obtained.

CAMBORNE—REDRUTH PUBLIC LIBRARIES

TRAINEE ASSISTANT

APPLICATIONS are invited from persons qualified to sit the Library Association's examinations. Partially qualified candidates wishing to widen their experience will also be considered. Salary scale £435 to £1,245, A.P. I for Part I, A.P. II for Part II.

Further particulars and application forms are available from the Chief Librarian, Public Library, Clinton Road, Redruth, Cornwall. Applications must reach the above address not later than a fortnight after the appearance of this advertisement.

S. C. WILSON, Clerk of the Council.

BOROUGH OF CASTLEFORD

SENIOR LIBRARY ASSISTANT

APPLICATIONS are invited from suitably qualified LIBRARIANS for this appointment at a salary in accordance with the scale for Librarians (£920 to £1,345), the commencing point to be in accordance with professional qualifications and experience.

N.J.C. Conditions: Superannuable; Terminable on one month's notice either side: Canvassing disqualifies. Further details from Borough Librarian and Curator, Carlton Street, Castleford.

Applications, on forms obtainable from me, to be returned not later than 9 a.m. on the 14th May, 1970.

ERNEST HUTCHINSON, Town Clerk and Chief Executive Officer,
Civic Centre, Castleford, Yorkshire.

DENBIGHSHIRE COUNTY COUNCIL

CARTREFLE COLLEGE OF EDUCATION, WREXHAM

APPLICATIONS are invited from chartered librarians for the POST of DEPUTY LIBRARIAN (Man or Woman). Salary is in accordance with N.J.C. Grade A.P. III, at present £1,445 to £1,575.

Application forms and further particulars are obtainable from the Senior Administrative Officer, Cartrefle College, Cefn Road, Wrexham, to whom they should be returned not later than 22nd May, 1970.

HUNTINGDON AND PETERBOROUGH COUNTY LIBRARY

BRANCH LIBRARIAN, WITTERING.

APPLICATIONS are invited for the above appointment, giving details of age, qualifications and experience and the names of two referees to reach the undersigned not later than 18th May, 1970. Salary on Librarian's Scale, £920-£1,345 (Part I Exam—£1,130 p.a.).

ERIC F. SMITH, Clerk of the County Council.
County Buildings, Huntingdon.

UNIVERSITY COLLEGE LONDON

CHARTERED LIBRARIAN required for POST of SENIOR LIBRARY ASSISTANT in charge of Periodicals Acquisitions. Starting salary in scale £1,100 by £50 to £1,450.

Applications, with names of two referees, should reach the Librarian, University College London, Gower St., WC1E 6BT, by 12 May.

CORPORATION OF LONDON

ST. BRIDE PRINTING LIBRARY

A vacancy exists in this small library of the history of printing for the post of Library Assistant. Salary between £789 and £1,124 according to age and experience.

For details write to: Librarian, St. Bride Printing Library, St. Bride Institute, Bride Lane, Fleet Street, London E.C.4.

CHELSEA COLLEGE OF SCIENCE AND TECHNOLOGY

(University of London)

Re-Advertisement

APPLICATIONS are invited from graduate Chartered Librarians for the appointment of ASSISTANT LIBRARIAN.

Candidates should have experience of academic library work.

Salary according to experience, on scale £1,240 to £1,470 [illegible] to £2,045 plus London Allowance. F.S.S.U. superannuation. Further details on request.

Application to the Librarian, Chelsea College, Manresa Road, London, S.W.3, by 18th May, 1970.

LONDON BOROUGH OF HARROW

EDUCATION DEPARTMENT

LIBRARY SERVICE

SENIOR ASSISTANT LIBRARIAN

AP. 2/3—£1,220 to £1,665 per annum inclusive (AP.3 for Chartered Librarian).

The post has special responsibility for work with children at Pinner Library.

Application forms and further particulars obtainable from the Town Clerk, Harrow Weald Lodge, Uxbridge Road, Harrow, HA3 6DH, returnable by [illegible] May, 1970.

LONDON BOROUGH OF HILLINGDON

MUSIC LIBRARIAN

AP4 £1,575-£1,800 p.a. PLUS £90 LONDON WEIGHTING

APPLICATIONS are invited for the above POST from Chartered Librarians with suitable knowledge and experience.

The successful applicant should be competent to organise a gramophone record library from its beginnings and eventually will have responsibility for the whole field of music librarianship in the Borough.

Application forms to be returned to the Director of Management Services, ref. L/25/1, Manor House, Hayes, Middlesex. Closing date 22 May.

LONDON BOROUGH OF HOUNSLOW

FULL-TIME LIBRARIANS required at FELTHAM SCHOOL, Boundaries Road, Feltham and Chiswick School, Burlington Lane, Chiswick, W.4. Salary Grade A.P.2, £1,220 to £1,445 (A.P.3 £1,445 to £1,665 if chartered). Successful applicant will be responsible for the running of the library and should be experienced.

Application forms from the Director of Education, 88 Lampton Road, Hounslow, returnable by 22nd May, 1970.

KING'S COLLEGE LONDON

APPLICATIONS are invited for a POST in the grade of JUNIOR LIBRARY ASSISTANT (salary scale £580 at age 16 to £900 at age 22). Minimum qualification, good G.C.E.

Application forms and further particulars from the Librarian, King's College, Strand, W.C.2, to whom completed applications should be sent within 10 days.

LIBRARIAN

A.L.A. wanted for small technical library forming part of Press and Public Relations Division. Interesting field with wide range of information activities. Administrative experience essential. Salary approximately £1,350 per annum.

Please reply to the Secretary (L), The Royal Society for the Prevention of Accidents (RoSPA), Terminal House, 52 Grosvenor Gardens, London, S.W.1.

LONDON AND SOUTH EASTERN LIBRARY REGION

JUNIOR ASSISTANT (Clerical Grade 1/2 rising to £1,130 plus up to £90 London Weighting) required for London and South Eastern Library Region. Five-day week, no evenings or Saturdays; Local Government Superannuation Scheme.

Further details and applications to the Executive Officer, Laser, c/o National Central Library, Store Street, WC1E 7DO, by 23rd May, 1970.

MAIDSTONE BOROUGH COUNCIL

MOBILE LIBRARIAN

APPLICATIONS are invited from CHARTERED LIBRARIANS for the above POST. Salary within Scale A.P. III £1,310 to £1,540. Housing accommodation will be considered in appropriate cases. Removal expenses.

Apply giving details of present and past employment with salaries and the name and addresses of two referees to the Borough Librarian, Central Library, St. Faith's Street, Maidstone not later than 21st May, 1970.

T. Scoles, Town Clerk.
13 Tonbridge Road, Maidstone.

OXFORD CITY LIBRARIES

LIBRARIAN

[illegible]

LOCAL HISTORY AND SPECIAL COLLECTIONS

APPLICANTS [illegible] Chartered Librarians with qualifications [illegible]

BOROUGH OF RADCLIFFE

PUBLIC LIBRARY

APPLICATIONS are invited for the vacancy of SENIOR ASSISTANT.

Salary on A.P.II grade, if qualified or Clerical III grade if unqualified.

Applications, including details of age, qualifications, and experience, together with the names and addresses of two referees, to the undersigned by 15th May, 1970.

H. A. FOX, Town Clerk, Town Hall, Radcliffe, M/c. 9TP, Lancs.

SUNDERLAND EDUCATION AUTHORITY

SUNDERLAND POLYTECHNIC

APPLICATIONS are invited for TWO POSTS of ASSISTANT LIBRARIAN in the Sir John Priestman Library of the Polytechnic. Candidates should preferably be Chartered Librarians.

Salary in accordance with the N.J.C. Special Scale for Librarians (£920 to £1,345, bar, to £1,575), starting point according to qualifications.

Hours of duty are 38 hours per week, including alternate Saturday morning duties and one evening duty per week, with compensatory time off.

Letters of application, giving details of age, education, qualifications and previous experience, and the names and addresses of two referees, should be sent to the Chief Administrative Officer, Sunderland Polytechnic, Chester Road, Sunderland, County Durham, within two weeks of the appearance of this advertisement.

Canvassing will be a disqualification.

SURREY COUNTY COUNCIL

COUNTY LIBRARY

APPLICATIONS are invited from suitably qualified persons for the undermentioned POSTS in the County Library:—

(1) ASSISTANT LIBRARIAN (ADMINISTRATION) at the County Library Headquarters, Esher, Surrey.

Grade A.P. 4—£1,575 to £1,800*.

Candidates must be Chartered Librarians with good all-round experience in view of the wide range of duties to be carried out. The person appointed to this post must own and be able to drive a car. Car allowance payable at the "casual users" rate.

(2) SCHOOLS LIBRARIAN (HEADQUARTERS).

(3) Branch Librarian at TATTENHAMS, BANSTEAD Urban District.

Librarians Grade—£920 to £1,345/£1,575*.

(4) LIBRARIANS I/C TRAVELLING LIBRARIES (three) based on ESHER*, EWELL* and GUILDFORD.

Librarian's Grade—£920 to £1,345.

*London Allowance of £90 per annum applicable except Guildford post. Generous relocation assistance available in approved cases.

Further particulars are obtainable from the County Librarian, 140 High Street, Esher, Surrey, to whom applications should be sent within 14 days of the appearance of this advertisement.

WEST RIDING COUNTY COUNCIL

ILKLEY COLLEGE OF EDUCATION LIBRARIAN

APPLICATIONS are invited from qualified Librarians for the POST of ASSISTANT LIBRARIAN which will become vacant on the 31st August, 1970. The successful applicant will be responsible, under the Tutor-Librarian, for the day-to-day running of the Library, and should therefore have experience of library administration.

Salary: £1,130 to £1,345 (N.J.C., A.P. II).

Further details and application forms may be obtained from the Principal, College of Education, Wells Road, Ilkley, Yorks.

WILTSHIRE COUNTY COUNCIL

BRANCH LIBRARIAN

HIGHWORTH

APPLICATIONS invited from Chartered Librarians or those who have passed Part II examination of Library Association. Special Scale £920 to £1,575 per annum.

Application forms and details from County Librarian, Mortimer Street, Trow- [illegible]

ANTRIM COUNTY LIBRARY

A new grading structure came into operation on April, 1970, and persons with appropriate professi experience since registration as Chartered Librarians invited to apply for the following posts:—

Librarian i/c Reference, Requests Salary

Divisional Librarian (Antrim and Ballymena New Towns Area) Salary

Assistant Divisional Librarian/Branch Librarian:

- **No. 1 Division (Lisburn)** Salary
- **No. 2 Division (Glengormley)** Salary
- **No. 3 Division (Ballymena)** Salary

Assistant Librarian (Schools, Colleges) Salary

Assistant Librarian (Cataloguing, Classification, Circulation) Salary

Applications are also invited from Chartered L for further posts of Assistant Librarians (Sala in the County Headquarters and elsewhere.

Applicants who expect to obtain the L.A. Part II nation (or equivalent) this year, may be appoi alternative positions of Senior Library Assista lower grade initially.

Further particulars from **County Librarian,** **Avenue, Ballymena,** to whom applications sh sent by **23rd May, 1970.**

LONDON BOROUGH OF HAMMERSM

LIBRARIES SERVICE

ASSISTANT ARCHIVIST

£1435/1665

Applicants must possess a good University De Diploma in Archive Administration, but applica graduates at present attending Diploma course considered. Opportunity to work with growing of older local records, and to encourage schools.

SENIOR ASSISTANT LIBRARIAN

£1435/1665 p.a.

Applicants must have successfully completed Association's Professional or Post Graduate ex For non-chartered Librarians, starting salary £ progression beyond £1435 dependent Chartered; transfer to £1435 immediate Register.

37-hour week. Holidays honoured. Postcard application forms, quoting L.14 and L.32 Personnel Officer, 233 Hammersmith Road, date 14 May.

MANCHESTER POLYTECHNIC

POLYTECHNIC LIBRARIAN

ications are invited for this appointment from qualified librarians ssing relevant experience at a responsible level.

ester Polytechnic was constituted on 1 January 1970 from the r Manchester College of Art and Design, Manchester College of ce and John Dalton College of Technology. The post of n is a new one, and the person appointed will be responsible e bringing together of the existing library facilities into an ed service and for the further development of libraries in Polytechnic.

Librarian will be an ex-officio member of the Academic Board.

y on the scale £3,275 to £3,845.

er particulars are obtainable from the Secretary, Manchester hnic, Lower Ormond Street, Manchester, M15 6BX, to whom cations, containing full particulars and the names and addresses ree referees, should be submitted by 1 June 1970. Please quote

CITY OF BIRMINGHAM POLYTECHNIC

School of Librarianship

CAREERS IN TEACHING

to the expansion of the degree course and other work of the ol of Librarianship, and to the appointment of staff to senior s in libraries, a number of vacancies exist for suitably qualified or women who would like to develop through teaching their s in Subject Bibliography; the Organization and Control of Lib- Classification and Cataloguing.

ding to experience and qualifications, appointment may be made the Senior or Lecturer Grade II grades, and would commence ember, 1970.

ARY SCALES: Senior Lecturer: £2,417-£2,752.
Lecturer II: £1,827-£2,417.

her details of the work of the School, forms of application, and the of appointment may be obtained from the Secretary, College of merce, Aston Street, Gosta Green, Birmingham, 4, to whom the ted application forms should be returned not later than 27th May. (V5985)

erborough City Libraries

Assistant

erence/Technical Librarian

£1,345–£1,575

ants must be Chartered Librarians.

post is newly established and offers interesting ence to the successful applicant.

expenses and in approved cases. particulars from the Librarian, Central Broadway, Peter- PE1 1RX, to whom ons, with the names referees, should be 18th May 1970.

lar Clarke, Town Clerk, Box 8, Town Hall, rough, PE1 1HG

gh of Stamford

gh Librarian

seum Curator

are invited for from suitably quali- on salary scale 4 (£1,575-£1,800). accommodation will if required. expenses paid.

giving full par- of education, qualifi- and experience, to- the names of two to reach me by the 1970.

ORD, Town Clerk, Hall, rd, Lincs.

sity of Wales

ITY COLLEGE

ANSEA

of English

Literature

invited for a post the Department

[illegible]

AUSTRALIAN NATIONAL UNIVERSITY

RESEARCH SCHOOL OF SOCIAL SCIENCES

HISTORY OF IDEAS UNIT

Research Fellow

or

Senior Research Fellow

Applications are invited for appointment as Research Fellow or Senior Research Fellow in the History of Ideas Unit of the Research School of Social Sciences (Head of Unit, Dr. E. Kamenka). Appointment is for three years in the first instance, and may be extended to five.

The successful applicant will be expected to devote himself full time to a major piece of research lying within the interests of the Unit. Research conducted in the Unit concentrates, in a cross-disciplinary way, on the development of ideas about man and society, in the eighteenth, nineteenth and twentieth centuries. The Unit has a special interest in the development of Marxist and socialist thought and in revolutionary ideologies and an applicant wishing to work in these fields would be especially welcome. Applicants should have demonstrated their capacity for serious research by publication or work approaching publication.

The salary of a Research Fellow is determined within the range $A5,400—$A7,250 per annum and that of a Senior Research Fellow within the range $A7,800—$A9,324 per annum. Salaries are at present under review.

Superannuation is on the F.S.S.U. pattern with supplementary benefits. Reasonable travel expenses are paid and assistance with housing is provided.

Further particulars may be obtained from the Secretary-General, Association of Commonwealth Universities (Appts.), 36 Gordon Square, London, WC1H 0PF.

Applications close on 30 June, 1970.

UNIVERSITY OF QUEENSLAND

Australia

SENIOR LECTURER IN HISTORY

Applicants should have an honours degree or a postgraduate degree and evidence of experience in or interest in research. No particular field of modern history is specified. The priority will be given to quality in a major area of modern history. Teaching capacity will be an important consideration.

The salary for a Senior Lecturer will be within the range $A7500-$A8750 per annum. (Salary scales are at present under review.)

The University provides Superannuation similar to F.S.S.U., housing assistance, study leave and travel grants for a permanent appointee of Lecturer status and above.

Additional information and application forms will be supplied upon request to the

Secretary-General,
Association of Commonwealth Universities (Appts.),
36 Gordon Square,
London, WC1H 0PF.

Applications close in London and Brisbane on 31 May, 1970.

Librarian

Civil Service College (Edinburgh)

The Civil Service College, which will be formally set up this summer and will provide a wide range of management training for civil servants, has a vacancy for a man or woman as Librarian Grade III.

The successful candidate will develop and arrange the library in Edinburgh, including, building up an initial book stock, institution of a list of journals, their procurement and circulation, cataloguing and books and periodicals, and preparation of abstracts and other information required by the staff and course members.

QUALIFICATIONS: Candidates must (a) have passed one of the following professional examinations of the Library Association, viz., the registration examination (1963 or earlier), the Part II (Final) examination (1964 or subsequently), or the post-graduate professional examination: or (b) have otherwise attained Associateship of the Library Association; or (c) hold an approved university degree, or diploma, in librarianship. At least 5 years' professional experience essential.

SALARY: £1,982-£2,392. Non-contributory pension. Promotion prospects.

WRITE to Civil Service Commission, Savile Row, London W1X 2AA, or TELEPHONE 01-734 6010 (ext. 229 (after 5.30 p.m. 01-734 6464 "Ansafone" service), for fuller details and an application form, quoting 628/70/B. Closing date 1st June, 1970.

Information Officers

Salary on scales: £1,075—£2,550

A number of vacancies exist in the Department of Planning and Transportation for professionally qualified librarians or information scientists, preferably graduates. A background of at least two years in a good special library or information service department, the construction, or engineering industry, would be particularly useful. Reading knowledge of any major languages would be an added qualification.

Duties will include work in connection with the computer-based systems of information retrieval being developed and experience of data processing, programming, etc., would be valuable. Other duties would include major responsibility for re-classifying and cataloguing the library basic stock by U.D.C. and abstracting for the various bulletins produced by the department as well as general information and bibliographical research work for customers.

Consideration can be given to newly qualified candidates for appointment at the lower end of the salary scales.

Application forms from The Joint Director, Department of Planning and Transportation (A/EO/149/TLS), County Hall, S.E.1. Closing date for receipt of applications 22nd May.

GLC

GREATER LONDON COUNCIL
Department of Planning and Transportation

THE ROYAL INSTITUTE OF CHARTERED SURVEYORS

Library and Technical Information Service

Three vacancies exist in the Library and Technical Information Service which will be serving the requirements of over 40,000 members and attached classes of the R.I.C.S., the Chartered Land Agents' Society and the Chartered Auctioneers' and Estate Agents' Institute, after unification of the three societies on 8th June, 1970. Applications are invited from suitably qualified Librarians for the following posts:—

(a) **Information Officer**
(Salary on scale £1,100—£1,580)

(b) **Assistant Information Officer**

(c) **Cataloguer and Indexer**
(Salaries for positions (b) and (c) on scale £900—£1,320)

Application forms and further information may be obtained from the Staff Secretary, R.I.C.S., 12 Great George Street, Parliament Square, London, S.W.1.

University College Cardiff

LIBRARY

Applications are invited for a post as an ASSISTANT LIBRARIAN in this University College Library. Candidates should be good honours graduates with either professional or other relevant postgraduate qualification or degree, and have the equivalent of not less than two years library experience. Salary scale £1,240 to £2,045 (bar) to £2,605. F.S.S.U. Further particulars may be obtained from the Registrar to whom applications (2 copies), including the names and addresses of two referees, should be addressed, quoting ref.: ADV 481. Closing date, Saturday 23rd May, 1970.

Registrar, University College, Cathays Park, Cardiff.

BOROUGH OF MARGATE

SENIOR LIBRARY ASSISTANT

1st ASSISTANT

required at modern branch library at Birchington-on-Sea.

Salary within grade A.P. I (£920-£1,130). Five-day week.

Applications, including age, qualifications, experience, and names and addresses of two referees should reach *Borough Librarian, Central Library, Victoria Road, Margate, by 18th May.*

VICTOR H. MELLOR,
Town Clerk and Chief Executive.

THE LIBRARY BOARD OF WESTERN AUSTRALIA

requires

Librarians

Due to the rapid development of this still relatively new service and the serious shortage of librarians generally in Australia, we should be glad to appoint some young librarians

(a) who have recently qualified or will qualify this year at library schools or

(b) who have a few years experience since qualification.

Those in category (a) would be appointed as **Professional Assistants:** Salary $4,128-$4,282 (Approx. £1,928-£2,000). Those in category (b) as **Assistant Librarians:** $4,436-$5,514 (Approx. £2,072-£2,576) or $4,898-$6,284 (Approx. £2,288-£2,936) if additionally in possession of a degree. Salaries for women are at present $171 per annum less than the male rates quoted above but are being equalised. After 1971 they will be the same as male salaries.

The Board operates the Headquarters organisation (accessions, cataloguing, circulation and bibliographical services) for all public libraries in the State; the subject-divided State Reference Library; and the Central Music Library, all of which are in Perth. Posts might be in any of these, but would not be in local public lending libraries. The total book stock of the service is a million volumes, and annual expenditure about $950,000.

In addition to normal annual leave, 3 months leave with salary is given every seven years. The Board gives substantial financial assistance to non-graduate qualified librarians who wish to study part time for a degree.

Two members of the staff will be in England in late June on leave, and could interview and advise applicants for appointment.

Librarians with interest in the following aspects of librarianship would be particularly useful. Acquisition, on a fairly large scale, cataloguing, the professional organisation of book supply to local public libraries, local history and archives, service to industry, music.

Selected applicants will be nominated for Assisted Passages to Western Australia. The £10 Sterling payable for each adult will be reimbursed by the Library Board.

Applications for appointment addressed by air mail to the undersigned, should give all relevant information and include a photograph of the applicant. Two references including one from a library school should be forwarded direct by the referees.

F. A. SHARR,
STATE LIBRARIAN.

3 Francis Street,
Perth, Western Australia 6000.

University of Amsterdam

chair of history

Applications are invited from historians for the post of Full Professor in Modern European History. It is not desired to limit the field or fields of History in which an applicant might be interested.

Salary: at present Dutch fl. 65,000 per annum.

Applications including curriculum vitae and list of publications should be sent before 1st June to the Chairman, Department of History, University of Amsterdam, Herengracht 220, Amsterdam-C.

WEST SUSSEX COUNTY COUNCIL

COUNTY LIBRARIAN

£3,200—£3,660

Chartered Librarians with good management experience are invited to apply for the post which will be vacant on the 1st October, 1970. Lump sum travelling allowance. Generous removal and resettlement allowances. Particulars from the Clerk of the County Council, County Hall, Chichester. Closing date [illegible] June, 1970.